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NEW GENERA AND SPECIES OF MELANOPLI FOUND
WITHIN THE UNITED STATES

(ORTHOPTERA; ACRIDIDAE)

BY MORGAN HEBARD

Part III

For over five years preliminary work has now been progressing in preparation of the series of the Melanopli, in the Philadelphia Collections, for revisionary treatment of this group as found within the United States.

A large number of the species are found abundantly over extensive areas and the problem of handling series of very large size has proved difficult. In order to avoid original descriptions in the final work, which will in itself necessarily be very large, we have, in the sorting, put aside the material representing new species or races, and have followed the plan of publishing on all of these in advance of the comprehensive treatment.

The present paper is the third of the resultant publications, of which our "Notes on Mexican Melanopli"¹ might be said to be the forerunner, as indicating the general arrangement, as understood by us, of the Melanopli known from that country. In our first paper,² only species other than those of the genus *Melanoplus* were treated. In the second,³ a number of species of *Melanoplus* were described. Since that time the general affinities as indicated by us have required no readjustment, except that in the genus *Melanoplus* the order throughout has been reversed.

The present linear arrangement of the genus *Melanoplus*, which places the majority of the macropterous species first and the brachypterous species last, is used by Morse in his recent most excellent treatment of the New England species.⁴ The reason is that brachypterism in the Melanopli indicates specialization from a macropterous and more primitive type. In the

¹Proc. Acad. Nat. Sci., Phila., 1917, pp. 251 to 275, (1917).

²Trans, Am. Ent. Soc., XLIV, pp. 141 to 169, (1918).

³Trans. Am. Ent. Soc., XLV, pp. 257 to 298, (1919).

⁴Manual of the Orthoptera of New England. Proc. Boston Soc. Nat. Hist., XXXV, pp. 197 to 556, (1920).

system of linear arrangement we strive to place the simplest forms first in a genus, grading up to the type of highest specialization.

The number of new species described in these preliminary papers is apparently large, but, considering the great size of the series now assembled for the study of the Melanopli, an even greater number of undescribed forms might easily have been expected. The number of species now appearing in the literature as valid is far in excess of the number recognized by Scudder. The series now before us, however, prove that very many recognized species, particularly among those described by that author, are mere synonyms. The completion of the studies of the Melanopli, found in North America south to the Mexican border, will consequently show that only a slightly greater number of known and valid species occur over this territory than were supposed to occur by Scudder in 1897.

The work of assembling sufficient material for a comprehensive study has been progressing steadily and the expedition during the summer of 1919, undertaken by Mr. Rehn and the author, was particularly successful. We believe that, for the region, practically all the widely and generally distributed forms are now known. In the western mountains, however, and particularly in the more isolated high areas, we are confident that intensive search among the lesser known ranges will reveal the presence there of numerous new species and geographic races.

Under the new species and the new geographic race assigned to the Gracilis Group of the genus *Melanoplus*, we have occasion to criticise the recent work of Mr. Blatchley.⁵ We are compelled to do this, as that author appears to be unable to differentiate between the variation found in the genitalia of some more plastic species and the differences shown in varied degree by the more constant genitalic features of other less plastic, though often closely allied, species. The most serious situation lies, however, in that the author's apparent ignorance of what is meant by contemporary biologists when treating an entity such as is termed a geographic race. We are certain that the geographic race must be recognized. We feel that the day is past when the entomologist labelled and ticketed as species, without further

⁵Orthoptera of Northeastern America, pp. 1 to 784, (1920).

comment, each specimen which had certain conspicuous features of difference. The geographic race is more subtle, and, to determine its validity, requires more thorough study and consideration of much more material than does the species. In the Melanopli the distinction between some species is far less striking than that between others, while the weighing of all evidence which can possibly be obtained is essential to determine the validity of certain geographic races.

As a result we find Morse's thorough, deliberate and conscientious work on the Melanopli almost universally correct. Blatchley is equally correct in considering most of the species distinguished by strikingly apparent features, but, with hardly an exception, he has failed to recognize the true values of the species or races wherever finesse or elaborate analysis was necessary. We regret that there is need to make so drastic an assertion as the above, but when we find an individual, after cursory examination of types and without time being given for study of the series available, attempting to relegate to oblivion numerous entities described by both Morse and ourselves, after years of study, incurring detailed and not hit or miss consideration, we feel obliged to speak.

It is a fundamental requirement in scientific work that no man synonymize or change the values of names appearing in the literature, without giving definite reasons for such action. Such reasons must be based on careful consideration and thorough analyses of all available evidence. Blatchley has not observed this requirement in his recent work.

In the present paper twelve new species and two new geographic races are described. The series of these new forms contain 939 specimens, of which all but 102 are in the Philadelphia Collections.

We take the present opportunity to thank for the loan of material, particularly important in determining the problems surrounding *Melanoplus viridipes*, Mr. J. R. Malloch of the Illinois State Laboratory of Natural History, Mr. Wm. T. Davis of New York, Mr. W. S. Blatchley of Indianapolis, Indiana, Professor A. P. Morse of Wellesley, Massachusetts, Mr. A. N. Caudell of the United States National Museum and Doctor Henry Fox of Macon, Georgia.

Oedaleonotus borckii orientis new subspecies (Plate XVI, fig. 1.)

This geographic race is at present known only from the higher portions of southern and northeastern Nevada. Westward its limit of distribution certainly occurs before the Sierran uplift is reached, as in that region *borckii pacificus* (Scudder) is found.⁶

We find *borckii orientis* to be very close to typical *borckii*, though not as close as *borckii pacificus*. It differs in the average smaller size, more grayish general coloration, proportionately wider interval between the tegmina of both sexes and caudal femora with internal and ventral surfaces yellow, showing no tinge of orange.

Like typical *borckii*, the present race differs from *borckii pacificus* in having the lateral bands of the pronotum weak or subobsolete on the metazonal portion of the lateral lobes. Though variable in intensity in all the races of this species, these bands are normally percurrent and much the heaviest in *borckii pacificus*, this feature being indeed the best one to distinguish that very weakly defined race from typical *borckii*.

Type.—♂; Lee Canyon, Spring Mountains, Clark County, Nevada. Elevation, 7000 feet. August 19, 1919. (Rehn and Hebard.) [Hebard Collection, Type no. 552.]

Size medium small for the genus, averaging smaller than in typical *borckii*, though no smaller than the average in *borckii pacificus* from the southern Sierras; form medium for the genus. Head and pronotum as in *borckii borckii*. Pronotum with medio-longitudinal carina well developed cephalad and caudad of the decided transverse sulci, subobsolete between these; lateral carinae weak, showing slight divergence caudad; caudal margin of disk very weakly obtuse-angulate produced. Tegmina elongate oval, separated by a marked interspace (.9 to 1.2 mm. in the type and series of paratype males⁷). Genitalia as in *borckii borckii*, the furcula very small, the cerci very slender and incurved distad. Prosternal spine short and sharply conical. Important features are noted in the color description.

⁶Study of the extensive series now at hand shows Scudder's *Melanoplus pacificus* to be a very weakly defined geographic race of Stål's *Acridium* (*Podisma*) *borckii*.

⁷This is subject to further variation, as the two Crestline and Ruby Range males before us have the tegmina broad oval and separated by an interspace .5 mm. in width. In males of the other races of *borckii* the tegmina usually slightly overlap or are attingent, in rare cases separated by an interspace, the maximum in the series before us being .6 mm. in width, in individuals of much larger size than those of *borckii orientis*.

Allotype.—♀; same data as type. [Hebard Collection.]

Similar to the male type except in the following features. Size decidedly larger, form robust. Pronotum similar (the series showing that the carinae and sulci are often weaker in this sex). Tegmina elongate ovate, slightly broader and separated by a wider interspace (1.4 to 1.9 in the allotype and paratypic females.⁸)

Measurements (in millimeters of extremes)

♂	Length of body	Length of pro- notum	Caudal width of pronotum	Length of tegmen	Width of tegmen	Length of caudal femur
Lee Canyon, Nevada, <i>type</i>	14	3.3	2.3	2.8	1.8	8.3
Lee Canyon, Nevada, <i>paratypes</i> (13)....	14-16	3.3-3.8	2.3-2.6	2-2.9	1.6-2	8.2-9.3
Crestline, Nevada...	13.5	3.4	2.3	2.7	2	8.7
Ruby Range, Nev- ada.....	15	3.8	2.6	2.6	2.1	9
♀						
Lee Canyon, Nevada, <i>allotype</i>	19	4.6	3	4	2.3	10.7
Lee Canyon, Nevada, <i>paratypes</i> (33)....	16.8-20	4-4.8	2.6-3.7	2.7-4	1.8-2.4	9-11.3
Crestline, Nevada (4)	16.2-18.7	4-4.4	2.7-3	2.3-3.4	2.2-2.7	9.6-9.9

The Spring Mountains series shows that, in the two thousand five hundred feet of vertical distribution through which this race was there found, the individual size remains unaffected.

Color pattern obscure. Type with head light pinkish cinnamon, occiput and cheeks minutely flecked with mummy brown, the former with a medio-longitudinal band of that color, which widens caudad, this band varying to weak or wholly obsolete in the series; a broad postocular band of mummy brown on each side, this varying to very weak in the series. Pronotum light pinkish cinnamon suffused and flecked with mummy brown, the post-ocular bar continued and occupying the dorsal half of the lateral lobes, but weakly defined, usually bister fading to snuff brown on the metazonal portions and frequently with a buffy fleck at the terminal portions of the principal sulcus. Tegmina light pinkish cinnamon suffused with bister, this least in dorsal portions and frequently deepening to blackish proximad near the costal margin. Abdomen light pinkish cinnamon, the proximal tergites heavily and extensively marked with black laterad. Antennae and cephalic and

⁸The females from Crestline have the pronotal carina and sulci more decided than in any from the typical series and the tegmina wider, broad oval, so that the interspace between these averages less (.3 to 1.1 mm.). The Crestline material probably shows in these features incipient geographic racial differentiation, as yet not sufficiently advanced to warrant nominal recognition. The differences discussed show convergence toward *borckii pacificus*, but the examples in all other respects are typical of the present race.

median limbs suffused sayal brown, tinged with greenish distad. Caudal femora sayal brown in exposed portions, with two weakly defined bars of bister, which beginning on the dorsal portion of the internal face run across the dorsal face, being very weak on the external section and, with a more proximal suffusion, make up the usual color pattern of the pagina, as found more conspicuously developed in other forms of the genus; ventral and ventro-internal portions barium yellow. Caudal tibiae with external surface whitish, heavily overlaid with niagara green, other surfaces niagara green, except in brief proximal whitish portion; spines white in proximal portions, black distad.

The series shows little color variation from the type described. In some the coloration is more generally sayal brown, in others bister with pale areas of exposed surface of caudal femora contrastingly cinnamon. The Crestline series shows the weakest color pattern of all, the general coloration being tawny-olive.

Specimens Examined: 54; 16 males and 38 females.

NEVADA: Lee Canyon, Spring Mountains, 6000 to 8500 feet, VIII, 18 to 21, 1919, (Rehn and Hebard), 14 ♂, 34 ♀, *type*, *allotype* and *paratypes*. Crestline, Juniper Mountains, 6000 feet, IX, 4, 1909, (Rehn and Hebard), 1 ♂, 4 ♀. Northern foothills of Ruby Range, Elko County, 5800 feet, IX, 18, 1919, (Hebard), 1 ♂.

In the Spring Mountains this insect occurs through the zone of juniper and pinyon and well up into the zone of the bull pine (*Pinus ponderosa douglasii*). It reached its greatest numerical abundance, being moderately numerous and widely distributed, in the sparse grass and low green plants growing on pebbly soil at 7000 to 7200 feet, where the junipers and pinyons also reached their optimum development. At Crestline it was very scarce, the specimens being found singly and widely scattered, occurring in areas where a low yellow-flowered composite and sage brush grew among the scattered junipers and pinyons. The single individual taken at the foot of the Ruby Range was found under conditions similar to those at Crestline.

Bradynotes albida new species (Plate XVI, figs. 2 and 3.)

This interesting species shows nearest relationship to *B. excelsa* Rehn (plate XVI, fig. 4), differing in a number of color features and particularly in the more whitish general coloration, the subobsolete principal transverse sulcus of the pronotum, carinate abdomen and distinctive type of male cerci.

These two species are of broad form, but by no means as broad as the other species of *Bradynotes*. They inhabit the upper

zones of the High Sierras, being found in a more rigorous environment than other species of the genus.

The cercal abbreviation in *albida* is exceeded only in *B. satur* Scudder, a very distinct species.

Type.—♂; Lone Pine Lake, Whitney Pass Trail, Sierra Nevada Mountains, Inyo County, California. Elevation, 10,000 to 10,100 feet. September 6, 1919. (Rehn and Hebard.) [Hebard Collection, Type no. 565.]

Size small for the genus, form rather heavy. Surface subglabrous, well supplied with elongate though exceedingly fine hairs. Head broad and full; vertex gently tumid, fastigium very shallowly concave between eyes, the lateral margins not at all carinate; frontal costa deplanate, showing very slight depression at the median ocellus, there as wide as the interocular space, immediately below that portion suddenly narrowed by a fine but distinct and sharply curved sulcus on each side, completely obliterated below, where the face, above the clypeus, is evenly convex. Eye only slightly longer than wide, one and one-third times as long as the infra-ocular sulcus. Pronotum short, with disk rounding into the lateral lobes without carina, lateral lobes with prozonal section moderately inflated in dorsal portion, this cut vertically by the median transverse sulcus, which on the disk is weakly indicated mesad and obsolete meso-laterad, first transverse sulcus distinct only on disk, principal transverse sulcus subobsolete on disk; medio-longitudinal carina of disk weakly indicated near cephalic margin and on metazona, elsewhere obsolete; caudal margin of disk almost transverse, very broadly obtuse-angulate emarginate at the intersection of the nearly transverse though very broadly convex halves. Tegmina and wings absent. Abdomen with a fine but distinct medio-longitudinal carina. Furcula represented by two slightly produced convexities of the tergite at its median emargination. Supra-anal plate elongate shield-shaped, raised in a weak shoulder at lateral margins on each side at end of proximal two-thirds, lateral portions broadly and deeply concave, median portion raised, in proximal half with surface concave between heavy convergent lateral carinae, in distal half weakly convex except for a small sub-apical impression. Cerci small, not twice as long as proximal width, lateral margins very weakly concave, converging to near apex, there the dorsal margin curves obliquely downward to the sharply rounded apex. Subgenital plate roughly conical, tapering to the produced and bluntly rounded apex, with surface ventro-mesad showing a weak concavity, lateral margins almost straight to apex. Cephalic and median femora slightly inflated, very weakly bowed.

Allotype.—♀; same data as type. [Hebard Collection.]

Much larger and more robust than male. Head with interocular space wider and showing scarcely any concavity, frontal costa at median ocellus four-fifths as wide as the interocular space. Pronotum similar to that of

male, except that the inflated portions of the lateral lobes are weaker. Ovipositor⁹ valves showing very weak curvature to their rather blunt apices, with no median shoulders and having the margins of contact subcrenulate. Cephalic and median femora not inflated and scarcely bowed.

Measurements (in millimeters)

♂	Length of body	Length of pronotum	Width of pronotal disk at principal sulcus	Length of caudal femur
Lone Pine Lake, California, <i>type</i>	15.8	3.4	3.1	8.2
Lone Pine Lake, California, <i>paratypes</i> (8).....	15.8-16.2	2.9-3.8	3-3.3	8.1-9
Mount Whitney California, (2).....	17.4-17.9	3.8-4	3.3-3.4	9-9
♀				
Lone Pine Lake, California, <i>allotype</i>	24.7	3.9	4.3	10.3
Lone Pine Lake, California, <i>paratypes</i> (7).....	23-25	3.6-4.1	4-4.1	9.7-10.3
Lone Pine Lake, California, <i>paratype</i> ¹⁰	21	3.2	3.7	8.4
Mount Whitney California, (4).....	24.4-25.5	3.8-4.3	4.3-4.6	10.2-10.7
Mount Gould, California,	23.2	4.	4.4	10

General coloration of head, prozonal portion of pronotal disk and exposed surfaces of femora cartridge buff, showing even more whitish in life than in dried specimens. Head with two postocular bars on each side of velvety black, the occiput flecked and suffused with velvety black, particularly caudad. Pronotum with prozonal portion of disk shading from cartridge buff to whitish laterad, metazonal portion of disk chamois; lateral lobes with a suffused metazonal band of velvety black dorsad, this individually extremely variable in width, remaining portions chamois. Mesonotum and metanotum suffused with black, the latter with a pale fleck on each side, which is usually conspicuous. Dorsal surface of abdomen honey yellow, the third and fourth tergites suffused with black. Ventral surface chamois, becoming ochraceous on caudal portion of sternum and on abdomen. Cephalic limbs cartridge buff marbled with a tinge of black, this more decided distad on the cephalic faces of the tibiae. Caudal femora cartridge buff, dorsal surface with a proximal fleck, a broad meso-proximal band, a weak medio-distal band and genicular areas black; the heavier band is continued to the median line on the external pagina, the weaker band invading that area only briefly, while

⁹In the species of this genus the ovipositor is carried with only the distal portion projecting. When in active use, however, it is probable that this organ can be fully extruded. Six specimens in the present series have been dried with the ovipositor in that position.

¹⁰This specimen, though having the ovipositor fully developed, appears to retain certain nymphal features.

homologous markings occur on the ventral face, these reaching to the ventral margin of the external pagina. Caudal tibiae proximad dark, then with a broad annulus of cartridge buff, the remaining portions pinkish buff, suffused proximad and distad; tarsi pinkish buff; spines pinkish buff with immediate apices black, spurs pinkish buff with distal half black.

In some specimens the ground coloration varies toward vinaceous-cinnamon, in discolored examples approaching mikado brown. The degree of intensity and extent of the black suffusions and markings is variable.

The coloration of the sexes is similar and in no specimens is the general coloration dark or the ventral surfaces of the caudal femora richly colored as in *excelsa*.

Specimens Examined: 28; 11 males, 15 females and 2 immature individuals.

CALIFORNIA: Mount Gould, Fresno County, 12,000 feet, VII, 9, 1910, (E. C. Van Dyke), 3 ♀, [Cal. Acad. Sci. and Hebard Cln.]. Pinnacles of Mount Whitney, Sierra Nevada, Tulare County, 13,770 feet, IX, 7, 1919, (M. Hebard), 1 juv. ♀. East foot of Whitney Pass, Sierra Nevada, Inyo County, 12,000 to 12,500 feet, IX, 7, 1919, (M. Hebard), 2 ♂, 4 ♀. Lone Pine Lake, Whitney Pass Trail, Sierra Nevada, Inyo County, 10,000 to 10,100 feet, IX, 6, 1919, (Rehn and Hebard), 9 ♂, 8 ♀, 1 juv.? ♀, *type*, *allotype* and *paratypes*.

At the base of a two thousand foot north-facing precipice, just above Lone Pine Lake, a rather extensive detrital slope of gray decomposed granite was examined on September sixth. Scarcely any vegetation grew there, but a specimen of this species was found on the bare gravel between the boulders. Intensive search showed the insect to be widely distributed over this apparently barren area, though very scarce and difficult to see, due to its exceedingly protective coloration. Our notes say—"One male was watched. It would take two or three short toad-like leaps, then climb up on the nearest granite pebble with spider-like agility and, after weaving slightly from side to side once or twice, would come to rest. It then blended absolutely with its surroundings."

On the following day the author found an immature individual far above timber line, among the pinnacles of Mount Whitney, on bare granite sand. No vegetation was noted anywhere near that elevation except lichens and one or two dandelions in a rock crevice. Below, at the head of Lone Pine Canyon and ascending Whitney Pass, six adults were taken. At the lower elevation there were a few arctic-alpine plants in the granite debris, at the upper elevation hardly any vegetation of any sort.

Melanoplus splendidus new species (Plate XVI, figs. 5, 6 and 7.)

This handsome insect is a member of the *Punctulatus* Group, showing a close superficial resemblance to *M. punctulatus arboreus* (Scudder), but differing in features of coloration, in the very different and less highly specialized male cerci and the less produced male subgenital plate.

Type.—♂; Jemez Hot Springs, Jemez Mountains, New Mexico. Elevation, 7500 feet. August 18, 1913. (John Woodgate.) [Hebard Collection, Type no. 562.]

Size medium large for the genus, form moderately robust. Vertex rather decidedly depressed between the lateral carinae, which latter are continued on the frontal costa to below the median ocellus, frontal costa broader and shallowly depressed between the lateral carinae. Eye slightly over twice as long as the infraocular sulcus. Pronotum with medio-longitudinal carina very weak but percurrent on prozona though weakest in mesozonal section, well developed on metazona; transverse sulci distinct, the principal sulcus scarcely heavier than the others; disk with lateral margins slightly divergent between first and principal sulcus, in other portions subparallel, caudal margin rather broadly obtuse-angulate produced with apex rounded. Tegmina fully developed, extending beyond caudal femora and abdomen, the rather narrow apex broadly rounded. Prosternal spine elongate, cylindro conical with apex rather sharply rounded. Furcula indicated on the surface of the tergite as broad, weakly convex areas, their broadly convex caudal margins projecting slightly beyond the caudal margin of the tergite, between which the tergite is rather broadly cleft to near its base. Supra-anal plate shield-shaped, lateral margins convex proximad, then broadly convex and moderately convergent to apices of latero-caudal carinae where a slight emargination on each side occurs, the remaining distal portion with margins straight, decidedly convergent, forming a rectangle with apex sharply rounded; medio-longitudinal sulcus percurrent, decided in slightly less than proximal half, weak in slightly more than distal half, subobsolete and very delicate transverse carina indicated at the juncture of these portions, lateral portions of plate broadly concave to disto-lateral carinae, these represented by parallel rounded ridges, well developed and slightly over twice as long as broad. Cerci broad at base, narrowing strongly in proximal two-fifths, margins subparallel in median fifth, the width there three-fifths as great as that proximad, distal two-fifths moderately expanded, three-quarters as wide as basal width, with a moderate upward and inward curvature; ventral margin straight in proximal three-fifths, thence broadly convex to the rather broadly rounded apex, situated dorsad; dorsal margin strongly concave to distal portion where it is very feebly convex.¹¹ Subgenital plate moderately broad, apically

¹¹ This is seen to be a development from the same source as *p. arboreus*, but in *splendidus* the disto-ventral lamellate expansion, so strongly developed in that insect, does not occur, and as a result the general appearance of the cerci is very different and distinctive.

abruptly elevated and thickened in a truncate projection, the apical production thus formed nearly four times as broad as thick and slightly broader than high.¹²

Allotype.—♀; same data as type, except that it was taken at 6400 feet on August 24, 1913. [Hebard Collection.]

Agrees with the type except in the following features. Size much larger, form decidedly more robust. Sulci and lateral carinae of the broader vertex and frontal costa much weaker, present on frontal costa only about region of median ocellus. Eye appreciably less than twice as long as infraocular sulcus. Medio-longitudinal carina of pronotum more conspicuous, particularly in metazonal portion. Tegmina and wings showing distinct reduction, extending slightly beyond caudal femora (failing to reach this point by a brief distance in the paratypic females), failing to reach the apex of the abdomen by a brief distance. Ovipositor valves with distal curvature decided particularly for the dorsal pair.

Measurements (in millimeters)

	Length of body	Length of pronotum	Greatest width of pronotal disk	Length of tegmen	Length of caudal femur	Width of caudal femur
♂						
<i>Type</i>	25.7	5.8	3.4	21	14	3.7
<i>Paratype</i>	25.8	5.9	3.4	19.2	13.2	3.7
♀						
<i>Allotype</i>	38.2	7.4	5	23.5	17.6	4.3
<i>Paratypes</i> (4)	34-40	6.8-7.5	4.6-5	18.7-23	15.8-17.3	4-4.8

Head grayish olive, maculate with dark grayish olive, on each side with a broad and shining postocular bar of blackish mummy brown. Pronotum with disk heavily overlaid, except rather broadly along lateral margins where the suffusion is weaker, with bone brown¹³; lateral lobes buffy, heavily flecked and suffused with bone brown, in the dorsal area the blackish mummy brown postocular bar is continued, much broadened but irregular with pale patches, so that the appearance is more that of a suffusion than of a bar. Tegmina hair brown, flecked with blackish, particularly along median line of costal fields. Wings transparent, hyaline, tinged with glass green proximad; veins black in all but caudal portion of axillary field, where they are glass green. Cephalic and median limbs hair brown, flecked and irregularly blotched, particularly on the external surfaces of the femora, with blackish

¹² This shows similarity in general structure to the type developed in *M. punctulatus punctulatus* and *p. arboreus*, the distal specialization being very much greater and normally more acute in those races and much the more decided in *p. arboreus*. Thus, in this respect only, *p. punctulatus* shows a condition about intermediate between that developed in *splendidus* and in *p. arboreus*.

¹³ The suffusion is seen to be weak, with many darker flecks, under the microscope.

mummy brown. Caudal femora drab externally, with proximal and genicular blotches and two intervening bars of darker brown very weakly defined; internal face dorsad with the corresponding darker areas more decided, blackish mummy brown, below and particularly in proximal portion bright ox blood red, often shading toward carmine. Caudal tibiae hair brown, shading to ox-blood red in distal half, this brilliant on flexor surface but merely tinging the extensor surface, external spines black, internal spines and all spurs buffy, black tipped.

In the series the general grayish coloration shows a more brownish tinge in individual specimens, the darker streaking and dotting showing little variation in intensity. The females have the dark and paler markings of the caudal femora averaging more decided than in the males. In these the pale areas are composed of an irregular proximal section, beyond this a marking like a short feathered shaft of an arrow meso-proximad, a large meso-distal section with margin produced proximad in a V and an irregular pre-genicular band, these areas individually ranging from pinkish buff to clay color.

Specimens Examined: 8; 2 males and 6 females.

NEW MEXICO: Jemez Hot Springs, Jemez Mountains, 7500 feet, VIII, 14 to 20, 1913, (John Woodgate), 2 ♂, 1 ♀, *type* and *paratypes*; 6400 feet, VIII 24 and IX, 17, 1913, (John Woodgate), 2 ♀, *allotype* and *paratype*; no elevation given, VIII, 13, 1911 and VIII 25, 1914, (John Woodgate), 2 ♀, *paratypes*, [all Hebard Cln.]. Jemez Mountains, VIII, 1909, 1 ♀, *paratype*, [Hebard Cln.].

Melanoplus eumera¹⁴ new species (Plate XVII, fig. 1; plate XVIII, fig. 1.)

1902. *Melanoplus robustus* Scudder and Cockerell (not *Caloptenus robustus* Scudder, 1875), Proc. Davenport Acad. Sci., ix, p. 50. [Organ Mountains, New Mexico.]

This insect is a member of the Ponderosus Group, showing nearest relationship to *ponderosus* (Scudder) (plate XVIII, fig. 2) and supplanting that species westward of the Pecos River in Texas.

The major difference between these species is found in the male cerci, though a normal specimen of *eumera* appears to be very strikingly and differently marked and colored from a normal specimen of *ponderosus*. On closer examination, however, these latter differences are seen to be the result of an intensification and consolidation of the color pattern in *eumera*, showing less actually diagnostic differentiation than might at first be presumed, and the convergence of the color pattern between recessively

¹⁴ From εὐμηρά = beautiful thighs.

colored examples of *eumera* and intensively colored specimens of *ponderosus* is decided.

Both species are at their best in a semi-arid environment. Hence *ponderosus* is widely and generally distributed through the semi-arid belt of central Texas, while the distribution of *eumera* is more local, the species being largely confined to the semi-arid sections of the mountains of Trans-Pecos Texas and southeastern New Mexico, the surrounding desert country apparently being too dry for this insect.

Type.—♂; Lost Mine Peak, Chisos Mountains, Texas. Elevation, 5500 to 6500 feet. September 6, 1912. (Rehn and Hebard.) [Hebard Collection, Type no. 560.]

Size large, form robust (averaging smaller and less robust than *ponderosus*). Vertex distinctly narrower than in *ponderosus*, interocular space very slightly wider than proximal antennal joint, the vertex with surface weakly depressed to fastigio-facial angle, the frontal costa weakly depressed in vicinity of the median ocellus. Eye nearly twice as long as infra-ocular sulcus. Pronotum with medio-longitudinal carina well developed on metazona, subobsolete except briefly cephalad on prozona, principal sulcus deep, other transverse sulci weak; disk with lateral margins almost subparallel, very feebly diverging caudad, caudal margin obtuse-angulate produced with apex sharply rounded. Tegmina and wings fully developed (in series falling slightly short of apices of caudal femora to extending a brief distance beyond apex of abdomen). Prosternal spine as in *ponderosus*, rather elongate, sub-cylindrical, slightly larger mesad than proximad, tapering fairly suddenly at distal extremity to the rather sharply rounded apex. Furcula represented by two small, bluntly obtuse-angulate productions of the tergite. Supra-anal plate as in *ponderosus*, broadly shield-shaped, the lateral margin briefly convergent and weakly convex, then subparallel, the distal margin strongly bracket-shaped; medio-longitudinal sulcus broad and deep proximad, narrower meso-distad, subobsolete distad, lateral portions broadly concave, the disto-lateral carinae indicated by small convexities which are slightly longer than broad. Cerci of same type as developed in *ponderosus* but smaller, with distal lobe less ample, its axis forming a more obtuse angulation with axis of shaft, its ventral margin not evenly convex. Cercus with margins of shaft in proximal two-fifths weakly convergent, the distal three-fifths formed by a lobe directed dorso-distad, not in-bent, longer than broad, about one and one-quarter times as broad as the basal width of the cercus, its margins broadly convex, the ventral margin at its base forming a minute angulate production with the ventral margin of the shaft, which distad begins to curve ventrad. Subgenital plate full, broad, its dorsal free margins laterad broadly concave to the moderately broad, transverse, thickened and briefly elevated meso-distal portion.

Allotype.—♀; same data as type. [Hebard Collection.]

Agrees with male except in the following respects Size larger, form more robust. Vertex broader, the vertex and frontal costa with depressed areas even weaker. Eye one and three-quarters times as long as infra-ocular sulcus. Tegmina (averaging) slightly shorter (in the series falling a brief distance short of the apices of the caudal femora to extending as far as the apex of the supra-anal plate). Ovipositor valves rather elongate, with distal curvature moderately decided.

Measurements (in millimeters)

♂	Length of body	Length of pronotum	Caudal width of pronotum	Length of tegmen	Length of caudal femur	Width of caudal femur
Lost Mine Peak, Texas, <i>type</i> ...	29.5	6.8	4	21.5	15.6	4.4
Lost Mine Peak, Texas, <i>para-types</i> (18)....	25.5–30	6–7	3.8–4.3	17.4–22.7	13.8–16.8	3.8–4.7
Chisos Mountains, Texas ¹⁵ (13).....	26.7–31.7	6.2–7	4–4.4	17–22.7	15–16.8	4.1–4.5
Sanderson, Texas.....	32	7.7	4.1	24.2	18	4.9
Organ Mountains, New Mexico (2)....	26.5–28.8	6.4–6.4	3.8–3.8	19.5–20.5	15.1–15.7	4.4–4.3
♀						
Lost Mine Peak, Texas, <i>allotype</i>	34 ¹⁶	7.3	4.8	20.7	17	4.6
Lost Mine Peak, Texas, <i>para-types</i> (8).....	30.7–39.7	7.3–8.4	4.7–5.7	19.8–22.8	16.2–19.2	4.2–5.2
Chisos Mountains, Texas ¹⁵ (12).....	36.4–40	8.6–9	5.6–5.7	23.1–26.4	19–19.8	5–5.3
Sanderson, Texas.....	42	9.2	5.9	28	21.2	5.3
Organ Mountains, New Mexico (2)...	37–35 ¹⁶	8–8.6	5–5.2	21.8–23	18.2–20	5–4.8
Florida Mountains, New Mexico.....	36	7.4	4.8	19.2	17	4.1

¹⁵ In canyon behind Pulliam Bluff.

¹⁶ Length estimated, abdomen extended in specimen.

Head pinkish cinnamon, dorsal surface darker, sayal brown, with broad post-ocular bar of shining bister on each side. Antennae ferruginous. Pronotum with disk sayal brown; lateral lobes with the broad postocular band dorsad of blackish bister, which is shining to the principal sulcus, on the metazonal portion represented by a narrower suffused line of bister, remaining portions of lateral lobes pinkish cinnamon deepening to cinnamon on metazonal portion. Tegmina with dorsal field verona brown; lateral field warm sepia, showing a few minute flecks of verona brown. Abdomen cinnamon buff, with a shining blackish brown patch on each side before the cercal bases. Distal portion of cerci and immediate apex of subgenital plate suffused with bister. Cephalic and median limbs pinkish buff, weakly washed laterad with walnut brown. Caudal femora cinnamon buff, dorsal surface with a proximal fleck, two broad transverse bars and entire genicular areas warm sepia, external pagina with a broad longitudinal maculation of warm sepia, which sends a ray to the proximo-dorsal fleck, a very broad band toward the first dorsal band and, before this, after narrowing strongly, it sends a broad band toward the second dorsal band; ventral surface orange-cinnamon, with a row of black dots below the lower marginal carina of the external pagina. Caudal tibiae carnelian red, with a small proximal annulus of warm sepia, spines black, spurs buffy, black tipped.

Intensification and recession of color pattern causes the series to show decided diversity in superficial appearance.

In the maximum intensive condition (Florida Mountains), the head and pronotum, including the lateral lobes, are very dark, almost as dark as the very broad postocular bar, while that portion of the ventral surface of the caudal femora against which the tibiae fit is carnelian red.

In the maximum recessive condition (Sanderson), the general coloration is all much paler, the postocular bar very narrow and terminated at the principal sulcus, the caudal tibiae and ventral surface of the caudal femora primuline yellow, the sternum abdomen and remaining portions of the caudal femora amber yellow, except the dark areas of the external pagina of the caudal femora, which areas in the female are ribbed, this caused by the fact that the sutures of the imbrications are all pale.

This latter feature does not appear to occur in the male sex of the species, though it is shown to various weak degrees in all the paler females of the series. It is the normal condition in both sexes of *ponderosus*.

Specimens Examined: 69; 37 males, 27 females and 5 immature individuals.

TEXAS: Sanderson, Terrell County, VIII, 25, 1912, (Rehn and Hebard), 1 ♂, 1 ♀. Moss Well, Chisos Mountains, 4500 to 5000 feet, IX, 5 to 8, 1912, (Rehn and Hebard), 2 ♀, 2 ♂, 1 juv. ♂, *paratypes*. Canyon behind Pulliam Bluff, Chisos Mountains, 4600 to 5000 feet, IX, 7, 1912, (Rehn and Hebard), 13 ♂, 12 ♀, 1 juv. ♂, *paratypes*. Lost Mine Peak, Chisos Mountains, 5500 to 7500 feet, 8), IX, 6, 1912, (Rehn and Hebard), 19 ♂, 9 ♀, 1 juv. ♀, *type, allotype, and paratypes*. Livermore Peak, Davis Mountains, 8200 feet, VIII, 30, 1912, (Rehn and Hebard), 2 juv. ♂.

NEW MEXICO: Dripping Spring, Organ Mountains, (J. Mendozas; T. D. Cockerell), 2 ♂, 1 ♀, [Mus. Comp. Zool. and Hebard Cln.]. Filmore Canyon, Organ Mountains, 5700 feet, IX, 9, (C. H. T. Townsend), 1 ♀, [U. S. N. M.]. Florida Mountains, (H. A. Pilsbry), 1 ♀, [A. N. S. P.].

In the Chisos Mountains the species was found in moderate numbers wherever scrub brush occurred. The steep northern slope of Lost Mine Peak, at from 5500 to 6500 feet, was the only place where individuals were very abundant. Immature individuals were frequent, though it was early September and the season well advanced. In the Davis Mountains, a few days earlier, occasional immature examples alone were encountered, in heavy weeds on the upper edges of meadow areas reaching up to 8200 feet on Livermore Peak.

At Sanderson one specimen was secured in low grasses and plants in the dry bed of a stream, while another was taken on the adjacent slopes at 2900 feet. This was the nearest approach to desert conditions in which the species was found.

Melanoplus tunicae¹⁷ new species (Plate XVIII, Figs. 3 and 4.)

We place this species last in the Ponderosus Group, preceded by *M. ponderosus viola* (Thomas)¹⁸ (plate XVIII, fig. 5). From that insect it differs in its slightly more slender form, average longer tegmina, usually somewhat more solid coloration and distinctive male cerci.

The species is apparently widely distributed over the lower Mississippi Valley, south and east of the known distribution of *p. viola*. Both these insects, however, are apparently very local, being found only in the scant undergrowth of lofty deciduous forests and particularly those growing on low flat ground. This fact probably explains the reason why the present large species has until now remained unknown. In the obscurity of its favorite environment it is difficult to locate, and often, when apparently very scarce, close and exhaustive search over limited but selected areas resulted in securing a fairly large series.

¹⁷The Tunica, a tribe of friendly Indians, are prominent in early French history of the lower Mississippi, in which region the present insect is found.

¹⁸Blatchley (Orth. N. E. Amer., p. 406, 1920) has considered *viola* "the short-winged form" of *M. ponderosus* Scudder. We find *viola* to be a geographic race of *ponderosus*, which is clearly defined over an extensive area of distribution. Various intermediate conditions between *ponderosus ponderosus* and *ponderosus viola* are found in all of Louisiana but the southeastern portion, and through the humid strip of eastern Texas.

The greatest degree of convergence in the Ponderosus Group toward the Querneus Group is shown by *tunicae*.

Type.—♂; Strickton, Rankin County, Mississippi. September 12, 1915. (M. Hebard.) [Hebard Collection, Type no. 564.]

Size large; form moderately robust, much as in *M. alabamæ* here described, appreciably less robust than in *M. ponderosus viola*. Vertex slightly but distinctly narrower than in *p. viola*, interocular space very slightly wider than proximal antennal joint, the vertex weakly depressed to fastigio-facial angle, the frontal costa weakly depressed in vicinity of the median ocellus. Eye twice as long as infra-ocular sulcus. Pronotum with medio-longitudinal carina moderately well developed on metazona, subobsolete except briefly cephalad on prozona, principal sulcus moderately deep, other transverse sulci weak; disk as in *M. eumera* here described, much as in *p. viola*, caudal margin similarly obtuse-angulate produced, with apex sharply rounded. Tegmina and wings somewhat reduced, failing to reach apex of supra-anal plate (in but one male of the series reaching the abdominal apex and in all showing reduction, though averaging longer than in *p. viola*). Prosternal spine rather elongate, subcylindrical, tapering rather suddenly distad to the rather sharply rounded apex. Furcula represented by two small, bluntly obtuse-angulate productions of the tergite. Supra-anal plate much as in *p. viola*, broadly shield-shaped, the lateral margins briefly convergent and weakly convex, thence weakly convergent and broadly convex to the apical portion, which is briefly produced and rounded; medio-longitudinal sulcus rather broad and deep in proximal two-thirds, thence rapidly becoming obsolete, the disto-lateral carinae indicated by small convexities which are longer than broad. Cerci proportionately decidedly smaller than in *p. viola*, very much smaller than in *p. ponderosus*, with dorsal apex much more sharply rounded than in those races. Cercus with margins of shaft weakly convergent in proximal half, thence diverging without angulation, so that the margins are broadly concave to the enlarged distal portion; distal portion formed by a lobe, directed dorsad and very weakly distad and not in-bent, its axis nearly vertical, this lobe a third broader than long, approximately as long as the basal width of the cercus, its margins converging distad to the rounded apex which, though broadly rounded, is much less so than in *p. viola* and very much less so than in *p. ponderosus*, the distal and ventro-distal margins of this lobe almost straight, thus forming two weakly defined angulations.¹⁹ Subgenital plate rather broad, its dorsal free margins broadly concave laterad to the moderately broad, transverse, thickened and elevated meso-distal portion.

¹⁹In the series slight variation occurs, to a type in which these margins are broadly convex with the angulations obsolete. Occasional specimens have the dorsal apex of the cerci slightly narrower or broader than in the type, but none are comparable to the type developed in *p. viola*.

Allotype.—♀; same data as type. [Hebard Collection.]

Agrees with male except as follows: Size larger; form more robust, though distinctly more slender than females of *p. viola*. Vertex broader, the vertex and frontal costa with depressed areas weaker. Eye nearly one and four-fifths as long as infra-ocular sulcus. Tegmina proportionately decidedly shorter, reaching to two-thirds of distance to apex of abdomen (normal condition in the series, rarely reaching three-quarters distance to apex of abdomen). Ovipositor valves moderately elongate, with distal curvature moderately decided (though apparently not as decided as in *ponderosus*).

Measurements (in millimeters) of extremes

♂	Length of body	Length of pronotum	Caudal width of pronotum	Length of tegmen	Length of caudal femur	Width of caudal femur
Memphis, Tennessee (2).....	24.9–27.2	6.1–6	3.6–3.8	15.7–13.2	15.7–16	3.7–3.8
Greenville, Mississippi (2)....	26.7–26.8	6–6.3	3.6–3.4	16–15.6	15.6–15.8	4–3.9
Strickton, Mississippi, <i>type</i> ...	26.5	6.3	3.8	15.4	16.8	3.9
Strickton, Mississippi, <i>paratypes</i> (14)....	26.5–29	6.3–7.2	3.7–4	14.7–17.2	15.8–17.7	3.9–4.2
Hattiesburg, Mississippi (10).....	26.7–29.2	6–6.8	3.7–4	14.7–17.7	16–17.8	3.8–4.3
Natchez, Mississippi (9)...	25.7–28.4	6–6.7	3.5–4	14.2–16.1	15.5–16.8	4–4.1
Lafayette, Louisiana (5)....	26.3–28.3	6.2–6.9	3.8–3.7	14.6–15.8	16.3–17.1	3.9–4.1
♀						
Memphis, Tennessee (4).....	34.8–36	7.4–8	4.8–5	15.9–17.4	18.7–20.6	4.2–4.8
Greenville, Mississippi.....	36	8.3	5	19	20	4.8
Strickton, Mississippi, <i>allotype</i>	36	7.9	4.9	16.2	18.9	4.6
Strickton, Mississippi, <i>paratypes</i> (8)	34.3–36	7.1–7.8	4.7–4.9	15.9–16.9	18.7–20.6	4.7–4.8
Hattiesburg, Mississippi (11)	32.5–37.2	7.2–8.2	4.7–5	14–19.7	18–20.3	4.4–4.8
Natchez, Mississippi (8).	32–36.2	6.8–8.3	4.6–4.8	14.7–17.4	18.3–20.2	4–4.8
Lafayette, Louisiana (10)...	30.8–34.5	7–8	4.6–5	15.8–18	18.5–21	4.1–4.9

It is clear that the size differences and degree of tegminal and wing reduction is a matter of individual variation in the present species, showing no geographic correlation.

Head cinnamon-buff with a faintly greenish tinge; dorsal surface darker, bister, with a moderately broad postocular bar of shining blackish brown on each side, this bar narrowly margined dorsad with cinnamon-buff. Pronotum with disk bister, narrowly somewhat paler along lateral margins cephalad; lateral lobes dorsad with the broad postocular bar continued to the principal sulcus, paling in its ventral portion, with ventral margin irregular, remaining portions of lateral lobes tawny olive, paling ventrad. Tegmina with dorsal field pale, avellaneous; lateral field suffused with bone brown, with a number of darker solid flecks of bone brown. Ventral surface of thorax and all of abdomen olive-ocher, the abdomen with a very small suffusion of shining blackish brown, on each side before the cercal bases. Cerci and immediate apex of subgenital plate suffused with prout's brown. Cephalic and median limbs old gold, weakly suffused and obscurely flecked with brown. Caudal femora with dorsal surface cinnamon brown, with a proximal area, two bands and genicular areas of chestnut brown; external pagina with suffusions of dark chestnut brown on distal and median portions, these the continuation of the dorsal bands, the remaining areas buckthorn brown paling to antimony yellow along the ventral margin; ventro-external surface saccardo's olive, except for a pregenicular buffy area, with a series of blackish flecks bordering the carina forming the ventral boundary of the external pagina; ventro-internal surface and ventral portion of internal surface vinaceous-rufous, except for a pregenicular buffy area. Caudal tibiae brown proximad, with a small blackish area, followed by a broad buffy annulus, the remaining portions of the proximal half buffy, suffused with brown, this shading into carnelian red dorsad and internally and apricot buff externally in distal half; spines black, spurs buffy with black tips.

Intensification and recession of color is developed to a moderate degree. The palest specimens have the dark areas considerably weaker and more reduced, the postocular bar very weak on head and extremely narrow on lateral lobes of pronotum, the dorsal surface of the head, pronotum and tegmina tawny olive.

In the darkest specimens the pale and dark areas of the caudal femora are much more contrastingly colored and clearly defined. In the series at hand occasional specimens have the dorsal field of the tegmina supplied with a few dark flecks, but the species may be said to average more solidly colored, with less flecking and mottling, than *p. viola*.

Specimens Examined: 87; 43 males, 43 females and 1 immature individual.

TENNESSEE: Memphis, IX, 16, 1915, (Hebard), 2 ♂, 4 ♀.

MISSISSIPPI: Greenville, IX, 14, 1915, (Hebard), 2 ♂, 1 ♀. Strickton, IX, 12, 1915, (Hebard), 15 ♂, 9 ♀, *type, allotype and paratypes*. Hattiesburg, IX, 11, 1915, (Rehn and Hebard), 10 ♂, 11 ♀. Natchez, IX, 13 and 14, 1915, (Rehn), 9 ♂, 8 ♀.

LOUISIANA: Lafayette, VIII, 9, 1915, (Rehn and Hebard), 5 ♂, 10 ♀, 1 juv. ♀.

At Memphis the species was very scarce in patches of lush weedy plants in a heavy deciduous swamp forest, while two specimens were found after long search in the undergrowth of a heavy upland deciduous forest, which undergrowth was composed of many low shoots and a little coarse grass. At Greenville it was found in the undergrowth of a bayou forest. At Strickton it was generally distributed through a dense river-swamp deciduous forest, where the ground was generally bare but with few weedy plants and areas of coarse swamp grass, and it was even more frequently encountered in a short-leaf pine and oak forest on slightly higher ground, in undergrowth composed of ferns, grape and other vines, cane and a variety of plants. At Hattiesburg the series was taken in the deep shade of a high and heavy deciduous forest, where the scanty undergrowth was composed of partridge-berry and some grape and raspberry vines.²⁰

At Natchez the species occurred in moderate numbers in a heavy deciduous forest, among tangles of raspberry and ground vines, at the base of the slopes of a ravine in the bluff formation. At Lafayette it was found in undergrowth composed of swamp grasses and low plants, weeds and vines of a tall open forest of tupelo, oaks and cypress near a bayou, and also in the rather scanty undergrowth of the heavy deciduous bayou forest.

Melanoplus alabamæ new species (Plate XVIII figs. 6 and 7.)

This handsome grasshopper is a member of the *Querneus* Group and is very closely related to *M. querneus* Rehn and Hebard,²¹ differing apparently in the slightly smaller size and slightly more slender form, but strikingly in the shape of the male cerci.

²⁰One female contained ninety-three gordius worms, each about two inches long; another five such worms, each about three inches long. We believe the infestation of the first specimen to be the maximum recorded for an Orthopterous insect.

²¹At the time *querneus* was described the species belonging to this group were referred to the "Fasciatus Group" by Rehn and Hebard (Proc. Acad. Nat. Sci., Phila., 1916, p. 231.). From our present knowledge of the species of *Melanoplus* we find that assignment to be incorrect, *fasciatus* (F. Walker) being a type more closely related to the phylum to which *borealis* (Fieber) belongs.

The male cerci show some convergence toward the type developed in *M. clypeatus* (Scudder), a species which belongs, however, to the distinct *Clypeatus* Group. These two groups include species showing many features of similarity; the members of the *Clypeatus* Group are, however, all decidedly larger and develop a distinctive color pattern of the caudal femora.

Type.—♂; Evergreen, Conecuh County, Alabama. August 4, 1915. (M. Hebard.) [Hebard Collection, Type no. 561.]

Size large, form moderately robust. Vertex and frontal costa below median ocellus shallowly depressed; interocular space narrow, slightly wider than proximal antennal joint. Eye slightly less than twice as long as infra-ocular sulcus. Pronotum with medio-longitudinal carina well developed on metazona, obsolete on mesozona, weak on prozona (varying in the series to percurrent, weak on prozona and mesozona and cut only by the principal sulcus), transverse sulci distinct; disk with lateral margins very feebly diverging caudad, almost subparallel, caudal margin broadly obtuse-angulate produced with apex rather broadly rounded. Tegmina semi-reduced, twice as long as median femur (varying to distinctly less than twice that length in the series), subacuminate, the apices narrowly rounded, sutural margins very weakly convex. Prosternal spine elongate cylindro-conical, with apex rather sharply rounded. Furcula merely the briefest of points projecting from the penultimate tergite, poorly indicated on the surface of the tergite as broad, feebly convex areas, between which the tergite is divided by a medio-longitudinal suture. Supra-anal plate broad shield-shaped, lateral portions longitudinally broadly concave, medio-longitudinal carina deep and narrow in proximal half (varying in one paratype to shallow and poorly defined), at end of which it is terminated by a low but sharp transverse carina which curves cephalad in its median section and caudad in its meso-lateral sections, in the distal half of the plate the disto-lateral carinae are distinct and parallel (in one paratype weakly convergent caudad) to proximal portion of this section. Cerci broad, the greatest distal width about three-quarters the length, very broad at base, narrowing very slightly to middle, the ventral margin moderately concave, the dorsal margin broadly angulato-concave with distal half straight, disto-ventral angle acute rectangulate, disto-dorsal section produced disto-dorsad, very broadly convex, this rounding weakly into the moderately oblique and almost straight distal margin; external surface of cercus showing a very feeble convexity, the axis of the cercus showing a weak inward curvature. Subgenital plate full, broad, proximo-lateral depth equal to median depth, free margin semi-elliptical in dorsal aspect; when seen from the side the lateral portions are broadly concave to the slightly produced blunted median section.²²

²² The degree of production of this extremity is seen to be slightly variable, as is also true of *queneus* in the series of that species now before us.

Measurements (in millimeters)

♂	Length of body	Length of pro- notum	Caudal width of pro- notum	Length of tegmen	Length of caudal femur	Width of caudal femur
Evergreen, Alabama, <i>type</i>	25.5	5.9	3.3	10.8	14.4	3.7
Evergreen, Alabama, <i>para-</i> <i>type</i>	23	5.7	3.2	9.8	14	3.6
Evergreen, Alabama, <i>para-</i> <i>type</i>	25.3	6	3.4	10.3	15	3.8
Greenville, Alabama, <i>para-</i> <i>type</i>	25	6	3.3	12	14	3.6

Head shining except dorsal portion, saccardo's umber becoming darker on genae, dorsal surface rich warm sepia, postocular bars blackish mummy brown, bordered dorsad by a very narrow buffy line. Antennae ochraceous-tawny, deepening to russet distad. Pronotum with disk rich warm sepia, lateral lobes shining except on metazonal portion, snuff brown deepening dorsad to blackish mummy brown, the postocular bars weakly defined except as a marginal line which in the prozonal portion, as on the head, is bordered dorsad by a very narrow buffy line. Tegmina with dorsal field light pinkish cinnamon, lightly suffused proximad and with a few flecks along sutural margin of mummy brown, lateral field mummy brown flecked with blackish, fading to buffy in the apical portion. Abdomen dorsad warm sepia, ventrad yellow ocher. Cephalic and median limbs mottled saccardo's umber. Caudal femoral marking strikingly characteristic of the species of this group, the dark bands spreading over the external surface so that three pale areas are blocked off, the proximo-dorsal of these elongate oval and broken by the characteristic small dark suffusion of the dorsal surface, the proximo-ventral area broader and elongate oval, the third of these situated beyond the median point and forming a broad transverse band, these areas well defined, clay color paling ventrad, except the dorso-proximal which is sayal brown, the remaining portions of the dorsal and external surfaces mummy brown; internal surface ochraceous-buff with two brown suffusions dorsad; ventral surface apricot orange, shading to ochraceous-buff distad and narrowly in external section. Caudal tibiae carnelian red, deepening meso-proximad to a suffusion of liver brown before the proximal section, which is light ochraceous-salmon internally, suffused very weakly with liver brown externally; spines black, spurs buffy with tips black.

²³ In addition to this material, a female belonging to the present group, from Brookhaven, Mississippi, is before us. This specimen was taken by Rehn on September 15, 1915, in grass in a forest of second-growth oak and short-leaf pine. As we have no males of this group from west of the above localities, we are unable to determine this specimen at the present time, although it is unquestionably a representative of the present or a very closely related species.

Specimens Examined: 13; 4 males and 9 immature individuals.²³

ALABAMA: Greenville, Butler County, VIII, 3, 1915, (Hebard), 1 ♂, *paratype*, 2 juv. ♂, 6 juv. ♀. Evergreen, Conecuh County, VIII, 4, 1915, (Hebard), 3 ♂, *type* and *paratypes*, 1 juv. ♀.

At Greenville the species was found, particularly about vine tangles, in the rather scanty undergrowth of a lofty forest composed chiefly of pine and sweet-gum. At Evergreen it was found to be very scarce in a heavy forest of magnolia, sweet gum and some holly and tulip trees, where the low ground was almost bare of vegetation but covered with leaf litter.

Like *querneus* this species is doubtless local in distribution, but at the proper season should be found in fair sized colonies in the scanty undergrowth of the forests.

Melanoplus platycercus new species (Plate XVII, figs. 2, 3 and 4.)

This species is closely related to the variable *M. rileyanus* Scudder. In the male sex it may be readily separated by the much shorter and broader cerci, in which the length approximates the greatest width, as well as by the shorter subgenital plate, which has the free margin almost evenly semicircular in dorsal aspect. Females of *platycercus* average smaller and more slender, but can not be separated from a few of the specimens of the large series of *rileyanus* now before us.

Type.—♂; Lone Pine Canyon, Sierra Nevada Mountains, Inyo County, California. Elevation, 8000 to 8371 feet. September 5 and 8, 1919. (Rehn and Hebard). [Hebard Collection, Type no. 559.]

Size small, as small as the smallest examples of *rileyanus* before us; form medium. Vertex rather narrowly sulcate, frontal costa shallowly concave at and below the median ocellus, its lateral margins subcarinate. Eye slightly over twice as long as infra-ocular sulcus. Pronotum moderately elongate, the disk widening very weakly caudad, medio-longitudinal carina distinct on metazona, weak elsewhere, sulci distinct but delicate, caudal margin of disk very weakly obtuse-angulate produced. Prosternal spine blunt conical (varying in the series to heavy, transverse, with apex very blunt). Tegmina considerably shorter than pronotum, ovate, rather broadly rounded distad, separated by a very brief interval. Furcula represented by a pair of slender, parallel, straight projections, which taper to their blunt apices, in total length equalling about one-quarter that of the supra-anal plate. Supra-anal plate slightly longer than wide, triangular, the lateral

margins showing very faint convexity, medio-longitudinal sulcus deep in proximal third, weak beyond, lateral portions of plate with surface rather strongly but broadly concave, disto-lateral carinae stout, parallel, about twice as long as broad, their distal extremities causing the lateral margins to project slightly at the point of juncture on each side. Cerci very broad, greatest breadth almost equal to length, due to the production ventrad of the proximal section; dorsal margin straight to the rounded apex, ventral margin rather strongly convex, this becoming more decided toward end of proximal three-fifths, thence very feebly convex to the apex, in this way an obtuse-angulate emargination is formed at the end of the proximal three-fifths; proximal portion of cercus with surface deplanate, vertical distal portion bent inward, with surface broadly and transversely concave (not longitudinally and deeply concave as in typical *rileyanus*). Subgenital plate with free margin in dorsal aspect of equal convexity throughout, showing sub obsolete bituberculation mesad (weak to obsolete in the series), on each side of which the margin shows feeble concavity for a brief distance.

Allotype.—♀; same data as type. [Hebard Collection.]

Agrees with type except in the following respects. Size larger, form rather slender (for females of the majority of the species of the brachypterous Melanopli). Sulci of vertex and frontal costa weaker and broader. Eye about twice as long as infra-ocular sulcus. Pronotum with sulci and carina even less decided, the lateral margins of the disk showing no greater divergence caudad. Ovipositor valves with apices moderately curved.

Measurements (in millimeters) of extremes

	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Width of tegmen	Length of caudal femur
♂						
<i>Type</i>	14.2	3.5	1.9	2.8	1.9	9
<i>Paratypes</i> (13).. <td>14.2–15.8</td> <td>3.3–3.6</td> <td>1.9–2</td> <td>2.7–2.9</td> <td>1.8–2</td> <td>8.6–9.2</td>	14.2–15.8	3.3–3.6	1.9–2	2.7–2.9	1.8–2	8.6–9.2
♀						
<i>Allotype</i>	19.5	3.9	2.6	3.1	2.1	10.1
<i>Paratypes</i> (15).. <td>18.5–22.5</td> <td>3.8–4</td> <td>2.4–2.7</td> <td>3.1–3.4</td> <td>2–2.3</td> <td>9.8–11</td>	18.5–22.5	3.8–4	2.4–2.7	3.1–3.4	2–2.3	9.8–11

Head avellaneous, dorsal surface suffused wood brown, with rather broad postocular bars of shining blackish brown on each side. Pronotum with disk suffused wood brown; lateral lobes with a rather broad dorsal band of shining blackish brown, which in the metazonal section is dull and paler, bone brown, remaining ventral portions of lateral lobes vinaceous-fawn. Tegmina with narrow dorsal section avellaneous, lateral section somewhat glossy bone brown. Abdomen dorsad cinnamon-buff, the proximal tergites marked heavily laterad with sharply defined areas of shining blackish brown. Ventral surface chamois, shading to cream buff distad on abdomen, slightly suffused with fawn color on sternum. Cephalic and median limbs fawn color, somewhat mottled. Caudal femora cinnamon-buff suffused with army brown, dorsal surface with a proximal area and two bands of bone brown,

external surface with the characteristic Melanoplid picturing of this color weakly developed. Caudal tibiae medici blue, fading to buffy proximad, with a small and weak proximal dark annulus; spines black and spurs buffy, black tipped.

The series shows little color variation. Some individuals are of a slightly more buffy general tone of coloration, others slightly more grayish.

Specimens Examined: 30; 14 males and 16 females.

CALIFORNIA: Lone Pine Canyon, Sierra Nevada Mountains, Inyo County, 8000 to 8371 feet, IX, 5 and 8, 1919, (Rehn and Hebard), 14 ♂, 16 ♀, *type*, *allotype* and *paratypes*.

This species was found in open areas of the pine forest, on bare soil of decomposed granite, where sage brush occurred in small quantities and scanty grasses were found. Difficult to locate and occurring in small colonies, the insect was found to be an active and powerful jumper. It was first seen, but not taken, in Lone Pine Canyon at an elevation of about 7500 feet.

Melanoplus rehni²⁴ new species (Plate XVI, fig. 8; plate XVII, fig. 5.)

This handsome species is related to *M. usitatus* Scudder. Males differ in the much more extensive shining black area of the pronotal lateral lobes, the slightly greater production and angulation of the caudal margin of the pronotal disk and the more elongate supra-anal plate and cerci, which latter are furthermore not decidedly narrowed distad.

Both sexes differ in the proportionately slightly longer pronotum. The majority of the females have the lateral lobes of the pronotum with a broad dark band, this band solid and broadening caudad; a few, however, lack this marking. In *usitatus* females have traces of such a marking, but these are irregular in ventral outline and are narrower in the metazonal than in the prozonal portion.

The species of this group all have the head unusually large in proportion to the body bulk. This is particularly apparent in *rehni*.

Type.—♂; Glendale, Douglas County, Oregon. Elevation, 1500 to 1900 feet. August 12, 1909. (Rehn and Hebard.) [Hebard Collection, Type no. 558.]

Size large for the group, medium for the genus; form medium for the group. Vertex little produced, sulcation rather broad and not deep, though more decided than in *usitatus*, frontal costa shallowly concave from above

²⁴In honor of our friend and co-worker Mr. James A. G. Rehn, the high standard of whose Orthopterological studies requires no comment.

to below median ocellus; lateral carinae of vertex and frontal costa showing appreciable convergence at fastigio-facial angle. Eye about one and three-fifths times as long as infra-ocular sulcus. Pronotum elongate, the disk showing feeble constriction in the prozonal portion, the lateral margins scarcely divergent on metazona; transverse sulci distinct, medio-longitudinal carina very weak except on metazona, not distinct on prozona as in *usitatus*, caudal margin of pronotal disk weakly obtuse-angulate produced, not weakly and broadly convex, subtruncate or feebly emarginate as in *usitatus*. Prosternal spine blunt conical. Tegmina shorter than pronotum, separated by a brief interval (slightly overlapping in the series from Siskiyou), ovate with apices rounded. Furcula represented by two minute points. Supra-anal plate slightly longer than wide (in the Siskiyou series averaging distinctly longer than wide, in *usitatus* frequently distinctly wider than long), surface weakly specialized, medio-longitudinal sulcus shallowly developed in proximal two-fifths, the lateral portions of the plate rather strongly concave, the lateral margins showing a trace of thickening opposite the cerci, the distal surface raised in the portion between the subobsolete disto-lateral carinae. Cerci heavy, somewhat over twice as long as basal width, dorsal and ventral margins weakly convergent to distal two-fifths, where the distal portion is bent upward, the margins there subparallel until the curve into the broadly rounded apex is reached, external surface of this distal portion shallowly concave. Subgenital plate conical, tapering to a distinct meso-dorsal tubercle, which is very feebly raised above the other portions of the free margin.

Allotype.—♀; same data as type. [Hebard Collection.]

Agrees with type except in the following characters. Size much larger, form more robust. Sulci of vertex and frontal costa weaker and broader. Eye about one and one-third times as long as infra-ocular sulcus. Pronotum with sulci and carina weaker, lateral margins of disk more divergent caudad, but not as much so as is usual in this sex of *usitatus*. Ovipositor valves slightly longer than in *usitatus*, with apices similarly decidedly curved.

Measurements (in millimeters) of extremes

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Width of tegmen	Length of caudal femur
Glendale, Oregon, <i>type</i>	18.5	4.8	2.7	4.1	2.5	10.8
Glendale, Oregon, <i>paratypes</i> (8)...	18–19.5	4.6–4.8	2.7–2.8	3.7–4.7	2.5–2.7	10.4–11
Siskiyou, Oregon, (7).....	17.5–19.3	4–4.7	2.5–2.7	4–4.3	2.6–2.8	10.7–11
♀						
Glendale, Oregon, <i>allotype</i>	29.5	6	4.1	5.2	3.4	13.2
Glendale, Oregon, <i>paratypes</i> (6)...	26.5–28	5.2–5.8	3.7–4	4.9–5.7	3.2–3.3	12.2–13.8
Siskiyou, Oregon, (6).....	23.7–28	5.2–5.7	3.9–4	5–5.8	3.4–3.9	12.8–13.7

Coloration.—Type. Head pinkish buff, with a very broad shining post-ocular band on each side, occiput bister paling to tawny-olive laterad and mesocephalad, Antennae clay color, becoming sayal brown distad. Pronotum with disk bister, paling narrowly to tawny-olive on each side of prozona; lateral lobes shining dark chestnut brown, narrowly margined ventrocephalad and more broadly ventrad with cinnamon-buff, the dark marking paling slightly to warm sepia on caudal portion of metazonal section. Tegmina bister. Abdomen dorsad cinnamon-buff, with a broad and sharply defined band on each side of shining blackish chestnut brown, which narrows caudad, terminating at the cercal bases. Distal portion of cerci and lateral portions of subgenital plate of this color, running more narrowly around the free margin of the latter. Underparts warm buff. Cephalic and median limbs clay color. Caudal femora externally snuff brown, deepening to bister distad, the dorsal surface with two darker subobsolete transverse bands, ventral surface ochraceous-buff proximad, in remaining portions ochraceous-salmon, with a pregenicular annulus of warm buff. Caudal tibiae dark bluish glaucous, fading proximad to whitish with a weakly defined brown annulus; spines black.

The allotype is similarly but less contrastingly colored, except that the lateral lobes of the pronotum are differently marked, showing dorsad a band of shining bister which broadens caudad to the principal sulcus, there being about two-fifths as deep as the lateral lobe, the metazonal portion entirely verona brown. In the paratypic series little color variation is shown, some specimens being slightly more reddish than others and the intensity of the markings differing individually to a slight degree.

The Siskiyou series is much darker. In these the males have no pale margin of the lateral lobes of the pronotum, while the occiput, disk of pronotum and tegmina are solidly bister, the ventral surface of the caudal femora hay's russet and other portions correspondingly darkened. In the females of this series some have the occiput, disk and lateral lobes of pronotum and tegmina vandyke brown, with color pattern generally obscured. One specimen shows, however, a strongly recessive type, being generally ochraceous-tawny, the pronotum entirely of this color, with only a trace of postocular darkening on the head. In this specimen the caudal tibiae are glass green, becoming buffy proximad.

Specimens Examined: 29; 16 males and 13 females.

OREGON: Glendale, Douglas County, 1500 to 1900 feet, VIII, 12, 1909, (Rehn and Hebard), 9 ♂, 7 ♀, *type, allotype* and *paratypes*. Siskiyou, Jackson County, 4100 to 5800 feet, VIII, 13, 1909, (Rehn and Hebard), 7 ♂, 6 ♀.

At Glendale the species was found to be scarce and very active in small openings among the heavy growth of tall firs, in a valley of the Rogue River Mountains. At Siskiyou, on the steep forested slopes of the Siskiyou Mountains, it was found scarce in

the forest undergrowth from 4200 to 5600 feet, two females being secured in the Canadian Zone forest up to 5000 feet, the others in the alpine undergrowth of a forest of scattered pine and alpine hemlock, where an interdigitating flora of the Canadian and Hudsonian Zones occurred.

Melanoplus oreophilus new species (Plate XVII, figs. 6 and 7.)

This species is very closely related to *M. montanus* (Thomas) and *M. washingtonianus* (Bruner), showing nearer affinity to the latter.

Compared with these species, it is found to differ in both sexes in the average darker coloration, less sharply defined color pattern and deep pink coloration of the ventral and internal faces of the caudal femora. Occasional individuals of *oreophilus*, however, have the color pattern more intensive. The tegmina average narrower in *washingtonianus* and *oreophilus* than in *montanus*, in which latter species they are usually broad lanceolate.

The male genitalia are distinctive. In *oreophilus* the cerci are distinctly more slender and show a slight expansion distad, the margins there being weakly convex and giving to the apices of the cerci a weakly spatulate contour, not shown in either *montanus* or *washingtonianus*. The male subgenital plate is more drawn out, with apical tubercle slightly more sharply rounded than in *washingtonianus*. In *montanus* this tubercle is usually obsolete, rarely bluntly indicated.

Type.—♂; Cloud Cap Trail, Mount Hood, Oregon. Elevation, 6000 to 7000 feet. August 18 to 20, 1910. (Rehn and Hebard.) [Hebard Collection, Type no. 559.]

Size medium, form moderately robust. Vertex narrower than in *washingtonianus*,²⁵ surface shallowly depressed between the distinct lateral carinae; frontal costa weakly depressed in vicinity of median ocellus. Eye about one and one-half times as long as infra-ocular sulcus. Pronotum much as in *washingtonianus*, medio-longitudinal carina weak on metazona, very weak on prozona (frequently obsolete between the sulci); transverse sulci weak, caudal margin of disk weakly obtuse-angulate produced with angle broadly rounded. Prosternal spine rather sharply conical (varying in the series to blunt conical).²⁵ Tegmina as in *washingtonianus*, slightly longer than pronotum.

²⁵This is an unreliable character, as the series shows variation in this feature to a condition in which it is as wide as in *washingtonianus*.

²⁶In *montanus* we find the prosternal spine to vary from very blunt and distinctly transverse to blunt conical. It is clear that this process is subject to decided variation in the group to which these species belong.

tum, overlapping (varying from subattingent to strongly overlapping in the series), lanceolate pads. Furcula represented by two small stout processes, springing from convexities of the tergite, the projecting portions about twice as long as broad with apices rounded. Supra-anal plate shield-shaped, somewhat triangulate, surface little specialized, medio-longitudinal sulcus percurrent but deep only in proximal two-thirds, lateral portions of plate shallowly concave, disto-lateral carinae feebly indicated as nearly parallel, low ridges, about twice as long as broad. Cerci distinctly over three times as long as proximal width (varying in the series to three times as long as proximal width), slender, ventral margin almost straight to apical portion where a slight convexity occurs, dorsal margin broadly concave in proximal three-fifths, broadly convex in distal two-fifths to the broadly convex distal margin, the apical portion of the cercus in consequence intermediate in width between the basal and median portions and subspatulate in outline (occasionally specimens show this distal spatulation reduced, the distal width being but very slightly greater than the median width; none show the cercus as broad, with apex as truncate as in *washingtonianus*). Subgenital plate appreciably, though only slightly, narrower than in *washingtonianus*, the sides converging to the rather sharply rounded apex, which projects dorso-caudad above the free disto-lateral margins of the plate.

Allotype.—♀; same data as type. [Hebard Collection.]

Agrees with type except in the following features. Size much larger, form much more robust. Vertex broader, similarly shallowly depressed but with lateral carinae weak. Eye one and one-third times as long as infra-ocular sulcus. Prosternal spine heavy, conical, with apex (normally) rather sharply rounded. Ovipositor valves moderately elongate, with distal curvature decided.

Measurements (in millimeters) of extremes

♂	Length of body	Length of pro- notum	Caudal width of pronotal disk	Length of tegmen	Width of tegmen	Length of caudal femur
Mount Hood, Oregon, <i>type</i>	17.5	4	2.3	5	2.6	10.2
Mount Hood, Oregon, <i>paratypes</i> , (103)	15.8–19	3.8–4.9	2.1–2.6	4.1–6	2–3	9.4–11.4
Blue Mountains, Oregon, (8)	17.2–19	4–4.3	2.6–2.4	4.7–6	2.3–2.5	10–10.3
♀						
Mount Hood, Oregon, <i>allotype</i>	25	5.3	3.7	7.1	3.3	12.8
Mount Hood, Oregon, <i>paratypes</i> (113)	19.5–27	4.9–5.8	3–3.9	4.9–7.6	2.3–3.5	11.4–13.6
Mount Hood, Oregon, 3290 feet	26.8	5.4	3.6	7.2	3.3	13.3
Blue Mountains, Oregon, (5)	23.8–26	4.8–5	3.3–3.5	5.3–6.5	2.9–3	11.8–12

The minimum extremes of size variation in the very large paratypic series before us, from the Hudsonian Zone on Mount Hood, are amplified by the presence of a few exceptionally small individuals, showing decided stunting, probably a result of the severe conditions under which their development had taken place.

Head deep olive buff, a broad postocular bar on each side of dark blackish olive, occiput and vertex olive brown. Antennae pecan brown, becoming darker distad. Pronotum with disk olive brown, shading to natal brown on metazona, lateral lobes with a shining band of bone brown dorsad which is narrow proximad, about two-fifths as wide as the lateral lobe at principal sulcus, caudad of this sulcus indicated by a dull suffusion of bone brown, remaining portions of lateral lobes deep olive buff showing a few flecks of brown. Tegmina bister with a few irregular blackish flecks, paling narrowly along the sutural margin and at apex to buff. Dorsal surface of abdomen tawny olive microscopically flecked with darker and with large irregular patches of blackish brown laterad on the proximal tergites. Ventral surface chamois. Cephalic and median limbs clay color washed with grayish and olivaceous. Caudal femora clay color with a grayish tinge, dorsal surface with two weakly defined irregular bars of brown, external face with the characteristic Melanoplid picturing defined in irregular areas of dark brown, the carinae margining the external pagina flecked with brown, these markings the more conspicuous on the ventral carina, which is of a paler buffy coloration; ventral surface and all but dorsal portion of internal surface jasper red, this sometimes confined to the internal half of the ventral surface. Caudal tibiae jasper red with a proximo-internal dark marking; spines black, spurs buffy, black tipped.

In females the tegmina and dorsal surface of the abdomen usually show numerous flecks of dark brown, while the latero-proximal dark areas on the latter are often much broken.

The general facies is distinctive, but plainly closer to that of *washingtonianus* than to that of *montanus*.

Specimens Examined: 232; 113 males, 118 females and 1 immature individual.

OREGON: Washington Gulch, foothills of Elkhorn Range, Blue Mountains, 3800 to 4300 feet, VIII, 14, 1910, (Rehn and Hebard), 8 ♂, 3 ♀. Cloud Cap Turnaround, north slope of Mount Hood, 3290 feet, VIII, 20, 1910, (Hebard), 1 ♀. Cloud Cap Trail, Mount Hood, 6000 to 7000 feet, VIII, 18 to 20, 1910, (Rehn and Hebard), 104 ♂, 113 ♀, *type, allotype and paratypes*, 1 juv.; VIII, 18, 1916, (G. P. Englehardt), 1 ♂, 1 ♀. *paratypes*, [Hebard Cln.].

In the Blue Mountains this insect was found scarce, one colony being located on the steep pine-clad hillsides among scant undergrowth, in which *Spiraea petuifolia* was predominant.

On Mount Hood, in the Hudsonian Zone, the species was very abundant on the open slopes covered with rich green grasses

above the fir forests and on the ridges. It was also found generally distributed but in small numbers at the foot of a glacier, in wet spots covered with green flowering plants and just above timber line on ground covered with volcanic ash in which scattered and thin dry grasses grew.

After dark individuals could be found in the dew-covered grasses, scarcely able to move, their bodies ice cold.

Melanoplus calapooyae²⁷ new species (Plate XVII, fig. 8; plate XVIII, fig. 8.)

Scudder unfortunately included under his *Melanoplus validus* material referable to this species.

The present species is clearly the optimum development in the Saltator Group, both as to size and specialization. Nearest relationship is shown to *M. validus* Scudder, which species occurs in southern Oregon. This is shown by the male cerci, which are of a similar type, though having reached a higher degree of specialization.

From Scudder's species *calapooyae* further differs in the larger size, more robust form, male supra-anal plate with distal narrowing portion fully as long as the proximal portion and color of male caudal tibiae, which are yellowish with a pink tinge.

In the form of the male supra-anal plate nearest agreement is with the Shastan *M. ascensus* Scudder, this plate in the present species being only slightly more elongate, with disto-lateral sculpturing heavier.

Type.—♂; Divide, Calapooia Mountains, Lane County, Oregon. Elevation, 1400 to 1600 feet. August 11, 1909. (Rehn and Hebard.) [Hebard Collection, Type no. 557.]

Size large, form robust for the group. Vertex and frontal costa as in *validus*, much as here described for *M. bernardinae*. Eye slightly less than twice as long as infra-ocular sulcus. Pronotum with medio-longitudinal carina distinct on metazona, subobsolete on prozona (in the series varying from obsolete to weakly defined in this section); sulci distinct, the principal sulcus deep; caudal margin of disk weakly obtuse-angulate produced. Prosternal spine rather elongate, slender, tapering very weakly to the bluntly rounded apex. Tegmina very slightly longer than pronotum, moderately overlapping, broad lanceolate, with apices rather sharply rounded. Furcula

²⁷The Calapooya Indians once inhabited the mountains which bear their name and from which the present species is known.

subobsolete, represented by minute points on the margin of the penultimate tergite, which are not as long as broad. Supra-anal plate triangulate shield-shaped, the lateral margins straight, strongly raised and almost parallel in proximal half, straight and convergent to sharp apex in distal half; surface of plate showing a shallow percurrent medio-longitudinal sulcus, in proximal half bordered by low ridges which are flanked by deep concavities caused by the raised lateral margins, distal half with two decided marginal carinae, running from the lateral angles to the apex of the plate and broadly convex to the lateral margins, so that on each side the distal portions of the cerci fit into the intervening space. Cerci heavy, three times as long as basal width, curving inward distad so that the apices, extending beyond the apex of the supra-anal plate, fit in snugly beside the apices of the paired plates beneath the supra-anal plate; ventral margin broadly concave to the produced apex, dorsal margin more broadly concave to dorsal extremity, beyond which the distal margin of the cercus is rather gently oblique and almost straight to the produced apex, least width of shaft three-quarters proximal width, greatest width of distal portion distinctly greater than proximal width; distal portion with angles rounded and lamellate toward the distal margin. The cercus is heavier, with more decided distal expansion and lamellation and much greater production of the apex, which is situated ventrad, than in *validus*. Subgenital plate with a distinct median production of the free margin, this margin somewhat thickened latero-proximad and in the rather broadly transverse produced portion.

Allotype—♀; same data as type. [Hebard Collection.]

Agrees with type except in the following characters. Size larger, form more robust. Sulcation of vertex and frontal costa weaker and broader. Eye about one and two-thirds times as long as infra-ocular sulcus. Prosternal spine heavier. Ovipositor valves rather strongly curved.

Measurements (in millimeters)

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Width of tegmen	Length of caudal femur
Divide, Oregon, <i>type</i>	22.5	5	3.1	5.3	2.9	11.2
Divide, Oregon, <i>paratypes</i> (76)	19.8-25	4.5-5.2	2.7-3.1	4.1-5.9	2.8-3.1	11-12.6
Drain, Oregon, (2).....	20.7-23	5-5.1	2.8-3	5.2-5.6	2.9-3	11.8-12
♀						
Divide, Oregon, <i>allotype</i>	25.8	5.9	3.9	5.9	3.5	13.8
Divide, Oregon, <i>paratypes</i> (67)	20.7-27	4.3-6.2	3.3-4.3	5-6.7	2.9-4	10.9-15
Drain, Oregon....	23.2	5.7	3.7	5.1	3.1	12.8

In this species the tegmina are found to overlap slightly in the majority of specimens, they are attingent in some and are separated by a slight to a moderate interspace (maximum 1.2 mm.) in a few individuals, particularly among the females. The tegminal size is decidedly variable; in the great majority of specimens they are broadly lanceolate, in rare examples broadly oval.

The furcula are normally so little developed in this species that we are not surprised to find frequent males entirely lacking these processes.

Coloration.—Type. Head orange-cinnamon, vertex deep russet, postocular blackish bars not wide and narrowly margined dorsad with buffy. Pronotum with disk russet, deepening to mars brown laterad, lateral lobes buffy suffused with tawny, except for an irregular shining blackish brown bar dorsad which deepens caudad, terminated at the principal sulcus and there occupying two-fifths the depth of the lateral lobe; metazonal portion deepens to mars brown dorsad. Tegmina mars brown with a very few darker flecks. Abdomen ochraceous-tawny heavily suffused with blackish proximo-laterad, a small area before bases of cerci on eighth tergite and tips of cerci blackish. Cephalic and median limbs tawny, slightly suffused. Caudal femora tawny with the trivittate marking, characteristic of many of the *Melanopli*, showing in blackish brown, but much blurred; ventral surface tawny. Ventral surface of insect and caudal tibiae cinnamon-buff, the spines of the latter black tipped.

In the female sex the coloration is similar, usually of a somewhat less reddish tone, the markings of the caudal femora not as dark and the caudal tibiae coral pink.

In the maximum recessive coloration the insects are ochraceous-tawny, the tegmina slightly darker, the postocular bars and other darker markings obsolete.

It is of interest to note that males or females of at least some of the species of this group may show pink or bluish caudal tibiae.

Specimens Examined: 149; 79 males, 69 females and 1 immature individual.

OREGON: Divide, Calapooia Mountains, Lane County, 800 to 1600 feet, VIII, 10 and 11, 1909, (Rehn and Hebard), 76 ♂, 67 ♀ 1 juv. ♀, *type*, *allotype* and *paratypes*; IX, 12, 1897, (A. P. Morse), 1 ♀, *paratype* of *M. validus* Scudder, [Hebard Cln.]. Drain, Douglas County, 300 to 350 feet, VIII, 11, 1909, (Rehn and Hebard), 3 ♂, 1 ♀.

At Divide the species was generally distributed and very common both in the grassy valley and on hillsides covered with a scattering growth of scrub oaks. At an elevation of 800 feet, however, it was particularly plentiful in a *brulé*, among dead pine boughs and tops. At Drain it was rare on hillsides of short, dry, yellow grass.

Melanoplus bernardinae new species (Plate XVII, figs 9 and 10)

This species is an aberrant member of the Saltator Group, and the smallest of the species there included. It shows no close relationships, and only a weakly defined development of the type of male supra-anal plate which is so distinctive a feature in males of the other species of the group.

The small size of the insect and brilliant coloration of its caudal limbs constitute striking features.

Type.—♂; Vivian Creek, San Bernardino Mountains, Riverside County, California. Elevation, 7200 feet. August 29, 1919. (Rehn and Hebard.) [Hebard Collection, Type no. 554.]

Size small for the genus, form slightly more slender than the other species of the Saltator Group. Vertex little produced, sulcation narrow and lateral carinae rather strongly developed, frontal costa with surface weakly concave from median ocellus ventrad, lateral margins slightly raised to fastigio-facial angle. Eye large, over twice as long as infra-ocular sulcus. Pronotum with medio-longitudinal carina distinct though not strongly developed, except between the principal and median sulci; sulci distinct, the principal sulcus deep; caudal margin of disk broadly obtuse-angulate produced. Prosternal spine longer than broad, moderately transverse, the sides showing little convergence to the bluntly rounded apex. Tegmina slightly shorter than pronotum (in the series varying to slightly longer than that dimension), slightly overlapping (varying to attingent in the series), broad oval, rounding distad but showing a slight angulation at the immediate apex. Furcula represented by two minute rounded projections no longer than broad. Supra-anal plate triangulate shield-shaped, the lateral margins moderately raised, straight and weakly convergent in proximal half, thence deplanate, straight and more strongly convergent to the sharply rounded apex; medio-longitudinal sulcus and margining carinae equally pronounced and occupying proximal three-fifths of plate, the lateral portions of the plate there moderately concave, disto-lateral carinae more lateral than usual in position, converging and blending distad with the lateral margins, thus rounded depressed areas beyond the raised portions of the lateral margins of the plate are formed, upon which rest the apices of the cerci. Cerci less than twice as long as basal width, bent weakly inward in distal third, with external surface weakly convex except along the ventral margin, where a weak linear depression occurs; ventral margin almost straight, dorsal margin weakly and broadly concave to apex which is truncate, with angles rounded and distal margin showing feeble convexity, the dorsal angle appreciably the more produced and sharply rounded, the marginal contour such that the distal portion of the cercus is very slightly wider than the narrowest portion of the shaft. Subgenital plate with a weak median production of the free margin, due to a weak lateral concavity of that margin, the free margin thickened latero-proximad and in the briefly transverse produced portion.

Allotype.—♀; same data as type. [Hebard Collection.]

Agrees with type except in the following features. Size larger, form more robust. Sulcation of vertex and frontal costa weaker and broader. Eye twice as long as infra ocular sulcus, Pronotum with medio-longitudinal carina weaker on prozona. Tegmina similar (but showing more individual variation than in male sex, in the series very slightly overlapping to separated by a minute interval, individuals with the most elongate tegmina having these distinctly broad lanceolate in form). Prosternal spine blunter. Ovipositor valves short, with distal curvature decided.

Measurements (in millimeters) of extremes

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Width of tegmen	Length of caudal femur
Vivian Creek, California, <i>type</i>	14	3.2	2	3	2	7.9
Vivian Creek, California, <i>paratypes</i> (6).....	13.5-15	3.1-3.7	2-2.3	2.9-3.7	1.7-2.1	7.9-8.1
High Creek, California, (3).....	15-16	3.7-3.6	2.2-2.3	3.7-4	2-2.2	8.4-8.8
Santa Ana Canyon, California.....	14	3.5	2.1	3.7	2	8.3
San Jacinto Peak, California (5)...	13.2-14.5	3.2-3.5	2-2.3	3-3.7	1.7-2	7.7-8.4
♀						
Vivian Creek, California, <i>allotype</i> ...	17	3.9	2.7	3.9	2.1	9.8
Vivian Creek, California, <i>paratypes</i> (34).....	16.5-19.7	3.8-4.1	2.4-2.8	3.7-5	2.2-2.8	9.3-10
High Creek, California (13).....	18.5-21.5	4.2-4.8	2.8-3.2	3.9-4.9	2.2-3	10-11.6
South Fork of Santa Ana River, California.....	16.5	4.7	2.9	4.9	2.9	11
San Jacinto Peak, California (4)...	19.5-20	4.3-4.6	3-3.2	4.8-5.4	2.7-2.9	10.6-9.8

It is of interest to note that, on the slopes of San Gorgonio Peak, the individuals taken at 7200 feet (Vivian Creek) average smaller than those taken at 9000 feet (High Creek). In the great majority of species of Orthoptera studied we have found size decreasing with an increase in altitude, if elevation showed any influence on the size of the individual.

Coloration. Head buckthorn brown, occiput very dark mummy brown, broad postocular bars shining blackish brown. Pronotum very dark mummy

brown, lateral lobes with dorsal half shining blackish brown to principal sulcus, below this prout's brown, shading dorsad in metazonal portion to mummy brown. Dorsal surface of abdomen cinnamon brown, very heavily and broadly suffused laterad on proximal tergites with shining blackish brown, small exposed portion of eighth tergite of this color and distal portions of cerci darkened. Cephalic and median limbs buckthorn brown, except the dorsal surfaces of the femora which are very dark mummy brown. Caudal femora cinnamon brown, with proximal median, distal and genicular areas of very dark mummy brown in the characteristic Melanoplid pattern, the darker areas very heavy; ventral surface dragons-blood red (brazil red in the most brilliant examples), paling to light coral red on the internal face dorsad, with a narrow pregenicular buffy annulus and the internal face with three large heavy suffusions of liver brown dorsad. Caudal tibiae gobelin blue, the spines black, the spurs buffy, black tipped, the tarsi buffy.

Slight recession from the described type is shown, except in the females from High Creek among which a strongly recessive type is developed. In these the general coloration is walnut brown and burnt umber, the postocular bar alone darker, the color pattern weaker. The caudal femora have the ventral surfaces bittersweet orange, while the caudal tibiae are glaucous blue.

Specimens Examined: 70; 16 males, 53 females and 1 immature individual.

CALIFORNIA: Santa Ana Canyon, San Bernardino Mountains, 6500 feet, VII, 25, 1906, (J. Grinnell), 1 ♀, [A. N. S. P.]. South Fork of Santa Ana River, San Bernardino Mountains, 6200 feet, VII, 6, 1906, (J. Grinnell), 1 ♀, [A. N. S. P.]. High Creek, south flank of San Gorgonio Peak, San Bernardino Mountains, 9000 feet, VIII, 29, 1919, (Rehn and Hebard), 3 ♂, 13 ♀. Vivian Creek, south flank of San Gorgonio Peak, San Bernardino Mountains, 7200 feet, VIII, 29, 1919, (Rehn and Hebard), 7 ♂, 35 ♀, 1 juv., *type*, *allotype* and *paratypes*. San Jacinto Peak, San Jacinto Mountains, 7000 to 10,000 feet, VIII, 20, 1914, (J. C. Bradley), 5 ♂, 4 ♀, [Cornell Univ., A. N. S. P. and Hebard Clns.].

At Vivian Creek the species was found rather abundant in the thin, dry and rather scanty grassy ground-cover in a ravine forest of massive conifers. At High Creek it was less abundant in a more open meadowy ravine, heavily carpeted with richer grasses, surrounded by a conifer forest of smaller trees than at Vivian Creek, and immediately above which the forest of Lodgepole Pines began, extending upward to timber line. We do not believe that the distribution of the species extends into that forest, in which the undergrowth is very scanty and grasses practically absent.

Melanoplus olamentke²⁸ new species (Plate XVII, fig 11.)

This species is a member of the *Lepidus* Group, to which we refer Scudder's two Californian species, *lepidus* and *ablutus*. It is the least specialized of the three, showing nearest agreement with the Sierran *lepidus*.

Compared with males of that species, males of *olamentke* differ in the strength of the median carina of the pronotal disk which is heavy on the prozona, the more evenly rounded tegminal apices, the shorter and heavier caudal femora, the more simple male supra-anal plate, the narrower distal portion of the male cerci and in the male subgenital plate being much shorter and not produced meso-distad.

Type.—♂; Southern Sonoma County, California. December 4, 1910. (J. A. Kusche.) [Hebard Collection, Type no. 556.]

Size and form medium, as in *lepidus*. Head as in *lepidus*, vertex little produced, sulcus of vertex and frontal costa moderately deep, interrupted briefly between lateral ocelli. Eye as in *lepidus*, large, over twice as long as infra-ocular sulcus. Pronotum with medio-longitudinal carina strongly developed on metazona and on prozona to first transverse sulcus, transverse sulci weak, caudal margin of pronotal disk weakly obtuse-angulate produced. Prosternal spine as in *lepidus*, elongate conical with rounded apex. Tegmina shorter than pronotum, slightly overlapping, broad oval and differing from *lepidus* in having the apices more evenly rounded, showing no trace of the sublanceolate condition normal in that species. Furcula shorter than in *lepidus*, represented by a pair of minute rounded projections about as long as broad. Supra-anal plate shield-shaped, medio-longitudinal sulcus well developed with marginal carina on each side strongly defined in proximal two-thirds, disto-lateral carinae short, not strongly developed, not following the trend of the lateral margins, these latter simple, not specialized opposite cercal bases. Cerci slightly over twice as long as proximal width, ventral margin nearly straight, dorsal margin strongly though broadly concave mesad, thence strongly though broadly convex to the apex, which is situated ventrad at the juncture of this margin with the ventral margin, the cercus as a result with median portion slightly over half as wide as proximal portion and distal portion slightly wider than median portion. Subgenital plate less ample than in *lepidus* and not produced, median width equal to lateral width, free margin not raised mesad but showing a transverse thickening in that section.

²⁸The division of the Moquelumnan Indians which once inhabited the region from which this species is known.

Measurements (in millimeters)

♂	Length of body	Length of pro- notum	Caudal width of pro- notal disk	Length of tegmen	Width of tegmen	Length of caudal femur
<i>Type</i>	16	4	2.3	3.8	2.1	9
<i>Paratype</i>	16.5	4	2.4	3.9	2.6	9.3

Coloration similar to that of *lepidus*. Head light brownish olive, deepening to sepia on occiput, with a weak postocular dark bar on each side. Antennae warm sepia. Pronotum with disk bister, lateral lobes with a broad shining blackish brown band dorsad to principal sulcus, below this saccardo's umber shading into bister on the dorsal portion of the metazonal section. Tegmina bister. Abdomen above snuff brown, the proximal segments broadly suffused on each side with shining blackish brown; ventral surface cinnamon-buff, becoming pinkish cinnamon distad. Cephalic and median limbs externally bister, internally paler. Caudal femora with pattern characteristic of many *Melanoplus* rather strongly defined in blackish brown and tawny-olive, ventral portion of internal surface and entire ventral surface hay's russet. Caudal tibiae deep bluish gray-green, the spines black except at bases.

In addition to the type, a single paratypic male is before us, bearing the same data, the property of the California Academy of Sciences.

Melanoplus viridipes eurycercus new subspecies (Plate XVI, figs. 9 and 10.)

1903. *Melanoplus viridipes* Blatchley, Orth. of Indiana, p. 305. [♂, ♀; Marion County, Indiana.]²⁹

1906. *Melanoplus viridipes* Morse, Psyche, XIII, p. 135. [♂; North Adams, Massachusetts.]

1920. *Melanoplus viridipes* Morse, Manual Orth. New Eng., p. 522. (Except figures.)

1920. *Melanoplus viridipes* Blatchley, Orth. Northeastern Amer., p. 365. (In part.)

McNeill's record from Bloomington, Monroe County, Indiana, is apparently quoted by Blatchley in his studies of 1903. A single female from McNeill from that locality is before us, and we are therefore unable to assign the record definitely. It is probable, however, that it applies to the present race, from what we know of its distribution.

²⁹The cerci are missing in the only male before us from this locality. The record, as a result, cannot be assigned, except from the probability indicated by the geographic position.

Of the other older records of *viridipes* and "*viridulus*," all apply to typical *viridipes* (plate XVI, figs. 11 and 12) except Lugger's state record for Minnesota, which was very possibly based upon an intermediate condition, such as we have from Wisconsin.

This geographic race agrees closely with typical *viridipes*, differing principally in the male cerci being heavier, shorter and taper distad, with apex bluntly rounded.

From over the wide range of this species eastward from Lake County, Indiana, not a single male before us shows a cercal development intermediate in character between the typical condition of *v. eurycercus* and that developed in *v. viridipes*, and we unhesitatingly describe this interesting geographic race. The race *v. viridipes* is similarly constant over a large portion of Illinois and some of the adjacent regions, as is demonstrated by very large series before us, in large part loaned by the Illinois State Laboratory of Natural History.³⁰

³⁰In his "Orthoptera of Northeastern America" Blatchley has treated *viridipes* and its allies in a particularly superficial and unsatisfactory manner. Of the distinct though closely related species described by Morse, he has synonymized *deceptus* and *similis* under *viridipes*. The hasty examination of types and other historic material, without effort being made to secure additional evidence, has caused Blatchley's work to fall far below the standard requisite in contemporary studies, particularly in groups such as the present, where forms occur having differences between them which cannot be valued accurately without thorough investigation.

That author's failure to comprehend or recognize geographic races is difficult to understand, but when we consider that he published on the present problem without effort to study, let alone see or compare, the large Illinois and eastern series available, we are not surprised that the conclusions are incorrect. If time for compilation of so large a work, having "ever in mind the needs of the tyro and not those of the specialist," alone was available, it is much to be regretted that the author's desire for revision was not curbed. Many nomenclatorial changes were made, based on what may well be termed snap judgments, which sadly lack the substantial backing to be gained by thorough analyses and comparisons of a reasonable amount of material. We are well aware that little more than a cursory examination of the historic specimens involved was attempted, though the resultant findings often blandly contradict the published conclusions of others, which had been reached only after years of constant study, building little by little toward a substantial and scientific knowledge of the Orthoptera of North America.

It is of interest to note that an intermediate condition occurs in material from Polk County, Wisconsin, showing nearer agreement with typical *viridipes*; while the males before us from Ann Arbor, Michigan, are also intermediates, referable to *v. eurycercus*, but showing distinct variation toward *v. viridipes*. In Indiana, however, the area of intergradation between the races is best demonstrated, as Blatchley has taken material of the species from a large number of localities. In the material before us from that state, males from Vigo and Tippecanoe Counties are typical *v. viridipes*; one from Fountain County and one from Vigo County are slightly atypical *v. viridipes*; intermediates are from Vigo and Lake Counties, while males from Fountain and Marion Counties are typical *v. eurycercus*.

It is apparent that the races intergrade in Indiana over the western section of the state, a certain amount of interdigitation occurring, *v. viridipes* sometimes pushing in from the west and *v. eurycercus* from the east.

Type.—♂; Derrick City, McKean County, Pennsylvania. June 6, 1915. (Wm. T. Davis.) [Hebard Collection, Type no. 563.]

Agrees closely with *v. viridipes*, differing only in the form of the cerci.³¹ Cerci moderately stout, curved inward distad, approximately twice as long as basal width, lateral margins almost straight and very feebly convergent to distal third, where the convergence becomes stronger to the broadly rounded apex; external surface of distal third showing a weak longitudinal depression.

Allotype.—♀; same data as type. [Hebard Collection.]

This sex can not be distinguished from females of *v. viridipes*. In the regions where the races interdigitate, males taken at the same time as the females are necessary for determination.

³¹As described by Scudder (Proc. U. S. Nat. Mus., xx, p. 256, (1897)). Blatchley's first description of the cercus of *viridipes* (Orth. of Indiana, p. 305, (1903)) is apparently drawn from intermediate material which he had before him.

Measurements (in millimeters) of extremes

♂	Length of body	Length of pronotum	Caudal width of pronotum	Length of tegmen	Width of tegmen	Length of caudal femur
Great Barrington, Massachusetts (7).....	16.2-17.2	4-4.1	2.2-2.4	4.8-5.2	2.3-2.3	8.7-9.2
Derrick City, Pennsylvania, <i>type</i>	17	4.2	2.3	5	2.4	9.4
Derrick City, Pennsylvania, <i>paratypes</i> (32) ..	16.8-18.3	4-4.2	2.3-2.4	4.5-5	2.3-2.5	9-9.3
Sounding Knob, Virginia (2)....	16-17.5	4-4.2	2.2-2.3	4.4-5.7	2-2.7	9.2-10
Cincinnati, Ohio...	18.8	4.8	2.7	6	2.7	10.2
Marion County, Indiana (10)....	16.5-19.5	4.2-4.6	2.4-2.8	4.9-6	2.4-2.9	9.7-10.2
♀						
Great Barrington, Massachusetts.....	21	4.7	3.2	5.4	3	10.2
Derrick City, Pennsylvania, <i>allotype</i>	21	5	3.6	5.1	3.3	10.8
Derrick City, Pennsylvania, <i>paratypes</i> (33) ..	19.4-22	4.6-5	3.1-3.6	4.2-5.8	2.4-3	9.4-11
Sounding Knob, Virginia (2)....	22.8-22	4.6-4.9	3.6-3.2	5.3-5.4	3.1-2.8	10.8-10.9
Marion County, Indiana (10)....	22.2-24.3	5-5.6	3.5-3.8	5.8-6.3	3.5-3.8	12-12.2

Not only does the series from Marion County, Indiana average somewhat larger in individual size than any other, but the greatest recession in color pattern is also shown.

In the series of paratypes the cerci show the following variation, the general type, however, remaining distinctive. Length ranging from one and three-quarters to two and one-quarter times proximal width. Apex ranging from very blunt to rather sharply rounded, median to meso-ventral in position. Ventral margin occasionally showing a very broad concave curvature distad. Depression of external surface distad subobsolete to rather strongly defined. The contour of the cercus often shows slight irregularities and in a single individual the cerci are rarely somewhat asymmetrical, one being slightly longer than the other or having the apex narrower.

In the eastern series a single specimen is before us, from North Adams, Massachusetts, the cerci of which may be considered atypical in character,

though showing more strongly the *v. eurycercus* type. In this individual the length of these appendages is two and one-third times the basal width, the lateral margins showing weak convergence in the distal two-thirds to the rather broadly rounded distal portion, with apex meso-ventrad. The greatest cercal abbreviation is found in the two males from Sounding Knob, Virginia, in which the length of these appendages is but one and one-third times the basal width.

The apical tuberculation of the subgenital plate in males varies in degree of development, though usually prominent and sharply rounded. Rarely it is divided, giving to the subgenital plate of such individuals a bituberculate appearance.

In coloration full agreement with typical *viridipes* is shown, except that the caudal femora exhibit an average more intensive pattern. The two transverse bars are heavier, running from their origin in the dorsal portion of the internal surface across the dorsal surface and obliquely across the external surface, there fusing at the lower margin of the pagina.³² This is not a constant feature, some series showing a distinctly more intensive pattern than others. The Marion County, Indiana series shows extreme recession, the caudal femoral markings being subobsolete in some males and the majority of females. The specimens from Cincinnati, Ohio; White Sulphur Springs, West Virginia, and Sounding Knob, Virginia show the maximum of color intensification.

Specimens Examined: 121; 70 males, 40 females and 11 immature individuals.

VERMONT: St. Albans, VI, 21, 1913, (C. W. Johnson), 3 ♂, 1 ♀, [Morse Cln.].

MASSACHUSETTS: Great Barrington, VI, 15 and 16, 1915, (C. W. Johnson), 7 ♂, 1 ♀, [Morse Cln.]. Cascade, North Adams, 1100 to 1400 feet, foothills of Mt. Greylock, VI, 14, 1915, (C. W. Johnson), 1 ♂, [U. S. N. M.]. One mile above Bashbish Falls, VI, 27, 1912, (C. W. Johnson), 1 ♂, [Davis Cln.].

NEW YORK: Groton, VI, 11, 1914, (E. A. Chapman), 1 ♂, 3 ♀, [Davis Cln.]. Mix Creek Valley, Cattaraugus County, VI, 11, 1915, (Davis and Bradley), 2 ♂, 1 ♀, [Davis Cln.]. Rock City, Cattaraugus County, VI, 6, 1915, (Davis and Bradley), 1 ♀, [Davis Cln.]. Seneca Junction, VI, 7, 1915, (W. T. Davis), 2 ♀, [Davis Cln.]. Ithaca, 1 ♀, [Hebard Cln.]. West Danby, V, 30, 1915, (W. T. Davis), 1 ♂, [Davis Cln.].

PENNSYLVANIA: Derrick City, VI, 6, 1915, (W. T. Davis), 32 ♂, 22 ♀, *type*, *allotype* and *paratypes*, [Davis, Hebard and Fox Clns.]. Ligonier, Westmoreland County, V, 23, 1905, (G. Brugger), 1 ♂, 1 juv. ♂, 1 juv. ♀, [A. N. S. P.].

MARYLAND: Jennings, Garrett County, VI, 24, 1907, (B. Long), 1 ♂, 1 ♀, [A. N. S. P.]. Near Jennings, Garrett County, 3000 feet, VI, 25, 1907, (B. Long), 2 ♀, [A. N. S. P.].

³²In the series of eighty-seven specimens of typical *viridipes* before us, not a single case occurs of the fusing of these bars ventrad on the external face of the caudal femora.

VIRGINIA: Sounding Knob, Highland County, 3800 and 4200 feet, VIII, 21, 1916, (M. Hebard), 2 ♂, 2 ♀, [Hebard Cln.]. Tazewell, Tazewell County, VI, 9, 1915, (L. O. Jackson), 1 ♂, 1 ♀, [U. S. N. M.].

WEST VIRGINIA: White Sulphur Springs, VII, 2, 1919, (W. T. Davis), 2 ♂, [Davis Cln.].

OHIO: Cincinnati, VI, 24, 1904, 1 ♂, [Blatchley Cln.].

INDIANA: Marion County, VI, 1 to 5, 1900, 1902 and 1904, (W. S. Blatchley), 10 ♂, 10 ♀, [Blatchley, Morse and Hebard Clns., A. N. S. P. and U. S. N. M.]. Bloomington, Monroe County, VI, 11, 1886, (J. T. McNeill), 1 ♀,³³ [Hebard Cln.]. Monroe County, (W. S. Blatchley), 1 ♂,³⁴ [Blatchley Cln.]. Vigo County, VII, 5, 1892, (W. S. Blatchley), 1 ♂, [Blatchley Cln.].

Atypical viridipes eurycerus.

Specimens Examined: 11; 6 males, 4 females and 1 immature individual.

INDIANA: Lake County, VI, 20, 1899, (W. S. Blatchley), 3 ♂, 1 ♀, [Blatchley and Univ. Minn. Clns.]. Vigo County, V, 16, 1904, (W. S. Blatchley), 1 ♂, [Blatchley Cln.].

MICHIGAN: Ann Arbor, V, 28, 1918, (T. H. Hubbell), 2 ♂, 3 ♀, 1 juv. ♀, [A. N. S. P.].

WISCONSIN: Polk County, VII, (C. F. Baker), ♂, [A. N. S. P.].

Intermediate between *viridipes viridipes* and *viridipes eurycerus*

Specimens Examined: 3; 3 males.

INDIANA: Vigo County, V, 16, 1904, (W. S. Blatchley), 1 ♂, [Blatchley Cln.]. Fountain County, 1907, (W. S. Blatchley), 1 ♂, [Blatchley Cln.].

WISCONSIN: Polk County, VII, (C. F. Baker), 1 ♂, [A. N. S. P.].

In the Appalachian Mountains this insect apparently frequents mountain meadows near the forests. In such an environment specimens, from their condition apparently the last of the season, were taken on Sounding Knob in Virginia.

We are told by Davis that he found the race very common at Derrick City, Pennsylvania. In life, as he states, the colors are bright and give individuals a most pleasing appearance. He found that "they climbed up on old stumps of trees and were running over the carpet of old leaves and the lesser woodland plants in every direction. They were moderately active, though it is true that the series was collected without much trouble."

From Blatchley's records, we learn that the series from Marion County, Indiana, was secured in upland woods.

³³ Without males from this locality we cannot definitely assign this specimen, except from the probability indicated by geographic position.

³⁴ The cerci are missing in this specimen, which as a result cannot be definitely assigned, except from the probability indicated by geographic position.

The insect is local in distribution, being found in colonies, and is in consequence more liable to be overlooked by the collector than the more generally distributed forms. The fact that it is a spring form further explains why, though so widely distributed, the species is poorly represented in most collections. The number of localities represented, and large series of specimens in the Davis Collection, again gives excellent evidence of the thorough and specialized field methods of our able friend.

Melanoplus calloplus new species (Plate XVI, figs. 13 and 14.)

The present species is a member of the Gracilis Group, showing an annectant type between *M. similis* Morse and *M. viridipes* Scudder.

Compared with *similis* it is separated by the shorter tegmina, barred caudal femora³⁵ and distinctive male cerci, which are bicolored, much less slender in distal half, widen there and are rather broadly truncate at the apex.

Like *similis*, this species has a slightly but appreciably smoother general facies than *viridipes*. In *calloplus* the pale and dark markings are usually somewhat more contrasted than is normal in *viridipes*, the markings of the caudal femora not as heavy or dark as is usual in that species, while the male cerci are of a distinct type.

Type.—♂; Collison Ridge, Bath County, Virginia. Elevation, 3200 feet. July 5, 1916. (M. Hebard.) [Hebard Collection, Type no. 553.]

Size, form and general structure as in *viridipes*. Fastigium of vertex and frontal costa similar but slightly more sulcate, the former with lateral margins weakly but distinctly rounded carinate.³⁶ Antennae as in *viridipes*, fully twice as long as pronotum. Eye slightly longer than cheek³⁷ nearly twice as long as the infra-ocular sulcus. Pronotum much as in *viridipes*, the percurrent medio-longitudinal carina weak, cut only by the principal sulcus;³⁸

³⁵In occasional females of this species, as well as of *viridipes*, these usually conspicuous markings are subobsolete or wholly absent.

³⁶In *viridipes* these margins are usually very weakly carinate, material from the Virginia Mountains of that species, however, showing variation toward the type described above.

³⁷Averaging very slightly longer in *viridipes*.

³⁸In *viridipes* the medio-longitudinal carina of the pronotum is sometimes cut by all three sulci or is sometimes subobsolete cephalad; it is normally cut by all but the first sulcus. Larger series of *calloplus* will probably show similar variation.

caudal margin of disk very weakly obtuse-angulate produced. Tegmina overlapping as in *viridipes*, slightly longer than pronotum, ovate, with apex broadly rounded. Wings greatly atrophied, but retaining the characteristic folding of the radiate field. Prosternal spine small, blunt conical. Furcula as in *viridipes*, represented by two minute projections, the areas from which they spring perceptibly thickened and separated by a broad angulate emargination. Supra-anal plate as in *viridipes*, shield-shaped, slightly longer than basal width, with a decided medio-longitudinal sulcus in proximal half, lateral portions broadly concave, distal portion slightly raised and very weakly concave, bounded laterad by the rounded parallel disto-lateral carinae. Cerci slightly over twice as long as proximal width, tapering gradually in proximal half to narrowest point, where it is half as wide as the basal width, thence expanding slightly, the convexity of the dorsal margin slightly the greater, to the rounded distal angles; rather broadly truncate, weakly oblique at apex.³⁹ Subgenital plate small, tapering to the distinct apical tubercle, which is twice as broad as thick.⁴⁰

Allotype.—♀; same data as type. [Hebard Collection.]

Similar to females of *viridipes*, differing in the slightly more sulcate fastigium of vertex and frontal costa, with lateral margins slightly more distinct, as described for the male type of this species. Differing from the male in the larger size, more robust form and (usually⁴¹) more ample tegmina. Prosternal spine short and heavy, very blunt conical. Ovipositor valves as in *viridipes*, moderately elongate, the dorsal pair with distal curvature weak, the ventral pair with such curvature very weak.

Measurements (in millimeters) of extremes

♂	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Length of caudal femur
West Point, New York (3).....	17-17.5	4-4.1	2.3-2.4	4.8-5.6	9.6-9.7
Collison Ridge, Vir- ginia, <i>type</i>	17.5	4.6	2.7	5.1	9.7
Collison Ridge, Vir- ginia, <i>paratypes</i> , (5)	15.8-17.5	4.2-4.3	2.4-2.8	4.8-5	9.4-10
White Sulphur Springs West Virginia, (2)...	16-16.8	4-4.2	2.4-2.6	5-4.8	6.2-9.6

³⁹Slight variation in the length and degree of narrowing as well as in the arcuation of the margins of the cerci is shown by the males before us; the type, however, being readily recognizable.

⁴⁰In one paratype slight bituberculation is shown.

⁴¹Decided tegminal size variation is shown by the series before us.

♀	Length of body	Length of pronotum	Caudal width of pronotal disk	Length of tegmen	Length of caudal femur
West Point, New York (4).....	23-24	4.9-5	3.3-3.3	5.3-6.2	10.2-11.3
Plainfield, New Jer- sey.....	22.7	4.9	3.2	5.7	11.2
Collison Ridge, Vir- ginia, <i>allotype</i>	23.8	5.3	4.4	5.4	11.8
Collison Ridge, Vir- ginia, <i>paratypes</i>	21-25.5	5-5.3	3.2-3.7	4.8-5.8	11-12
Snickers Gap, Vir- ginia.....	24.5	5.2	3.9	6.4	11.9
White Sulphur Springs, West Virginia.....	26.3	5.8	3.5	6.2	12.3

Coloration similar to that occasionally developed in *viridipes*, differing from the usual in that species as discussed above in the preliminary comparison.

Male. Head reed yellow, occiput brownish olive, a broad shining black postocular bar on each side, eyes and antennae cinnamon brown. Pronotum with disk brownish olive, lateral lobes in dorsal section (three-fifths of greatest depth) shining black, remaining portions ivory yellow. Tegmina immaculate brownish olive. Abdomen isabella color dorsad, chamois ventrad, the penultimate sternite tipped with shining black, the entire subgenital plate shining black except in subchitinous portion. Cerci shining black except for a quadrate dorso-proximal area of chamois. Cephalic and median limbs olive-yellow, fading on median femora proximad to olive-ocher. Caudal femora olive-ocher, showing two broad transverse dorsal bands of prout's brown which, on the external face, run obliquely cephalad to the median line, entire genicular area blackish, the paler area before this often tinged with green. Caudal tibiae clear light yellowish olive, with a small black basal annulus; the spines black, the spurs buffy with black tips.

Female with less contrasting but similar coloration. Head tawny shading to buff, tinged with tawny on genae and dark cinnamon-brown on occiput, broad postocular bars shining blackish brown, eyes prout's brown, antennae cinnamon brown. Pronotum with disk cinnamon brown, this continued on the dorsal portions of the lateral lobes, that area frequently shining blackish brown along the ventral margin and cephalad; lower two-fifths of lateral lobes buffy, weakly tinged with tawny. Tegmina immaculate prout's brown. Abdomen ochraceous-tawny dorsad, suffused with cinnamon-brown, ventral surface weak yellow ocher. Cephalic and median limbs mars brown, the femora with a greenish tinge. Caudal femora dorsad vinaceous-tawny with two broad transverse bars of mars brown (individually varying from weak to well defined), these scarcely traceable on the russet to pecan brown external face; genicular lobes, laterad only, blackish with genicular areas brown.

Caudal tibiae dark olive buff becoming brownish buff proximad and distad, with a small black annulus near base.

Specimens Examined: 29; 13 males and 16 females.

NEW YORK: West Point, VI, 14, 1914, (W. T. Davis), 4 ♂, 7 ♀, [Davis Cln.].

NEW JERSEY: Plainfield, VIII, 4, 1907, (W. T. Davis; on ridge to west of town), 1 ♀, [Davis Cln.].

VIRGINIA: Collison Ridge, Bath County, 3200 feet, VII, 5 and 8, 1916, (M. Hebard), 6 ♂, 5 ♀, *type, allotype* and *paratypes*, [Hebard Cln.]. Snickers Gap near Bluemont, V, 28, 1914, (W. T. Davis), 1 ♀, [Davis Cln.].

WEST VIRGINIA: White Sulphur Springs, VII, 2 and 3, 1919, (W. T. Davis), 2 ♂, 1 ♀, [Davis Cln.].

TENNESSEE: Mayland, Cumberland Plateau, Cumberland County, VI, 9, 1920, (S. Markovitch, in sylvan surroundings), 1 ♂, 1 ♀, [Hebard Cln.].

During the summer of 1916, the author collected constantly in the vicinity of Hot Springs, Virginia. The mountain ridges in this region are numerous and all but the highest are covered with heavy deciduous forests. On one of these, Collison Ridge, the typical series was taken at 3200 feet, just below the summit of the ridge, at its southwestern extremity, on the eastern slope. One small colony was found on July 5, when an intensive search was made. On July 8 this was repeated, four more individuals being secured in the original spot and close by in another similar area. For a month from this date we were constantly on the lookout for this species, no others being found at the original spot or elsewhere. The series was secured in the forest undergrowth of mountain laurel, huckleberry and other knee-high to waist-high bushes. The males were the more active, remaining up in the bushes and slipping through them rapidly, or springing from twig to leaf, but never to the ground.

We believe *calloplus* to be a thamnophilous sylvan species, occurring in widely scattered colonies. It may well be termed a late spring form, appearing adult probably earlier than the great majority of the *Melanopli*.

EXPLANATION OF PLATES

PLATE XVI

- Fig. 1.—*Oedaleonotus borckii orientis* new subspecies. Lateral view of male (*type*). ($\times 3$)
- Fig. 2.—*Bradynotes albida* new species. Cercus of male (*type*). (Greatly enlarged.)
- Fig. 3.—*Bradynotes albida* new species. Dorsal view of female (*allotype*). ($\times 3$)
- Fig. 4.—*Bradynotes excelsa* Rehn. Cercus of male (*type*). Mount Tyndall, California, 12,000 feet. (Same scale as fig. 2.)
- Fig. 5.—*Melanoplus splendidus* new species. Cercus of male (*paratype*). (Greatly enlarged.)
- Fig. 6.—*Melanoplus splendidus* new species. Lateral outline of distal portion of abdomen of male (*paratype*). ($\times 8$)
- Fig. 7.—*Melanoplus splendidus* new species. Lateral view of female (*allotype*). ($\times 2$)
- Fig. 8.—*Melanoplus rehni* new species. Lateral view of pronotum of female (*allotype*). ($\times 3$)
- Fig. 9.—*Melanoplus viridipes eurycercus* new subspecies. Lateral view of caudal femur of male (*type*). ($\times 3\frac{1}{2}$)
- Fig. 10.—*Melanoplus viridipes eurycercus* new subspecies. Cercus of male (*type*). (Greatly enlarged.)
- Fig. 11.—*Melanoplus viridipes viridipes* Scudder. Lateral view of caudal femur of male. Muncie, Illinois. ($\times 3\frac{1}{2}$)
- Fig. 12.—*Melanoplus viridipes viridipes* Scudder. Cercus of male. Muncie, Illinois. (Same scale as fig. 10.)
- Fig. 13.—*Melanoplus calloplus* new species. Lateral view of caudal femur of male (*type*). ($\times 3\frac{1}{2}$)
- Fig. 14.—*Melanoplus calloplus* new species. Cercus of male (*type*). (Same scale as fig. 10.)

PLATE XVII

- Fig. 1.—*Melanoplus eumera* new species. Lateral view of female (*allotype*). ($\times 2$)
- Fig. 2.—*Melanoplus platycercus* new species. Dorsal view of distal portion of abdomen of male (*type*). (About $\times 11$)
- Fig. 3.—*Melanoplus platycercus* new species. Cercus of male (*type*). (Greatly enlarged.)
- Fig. 4.—*Melanoplus platycercus* new species. Dorsal view of female (*allotype*). ($\times 3$)
- Fig. 5.—*Melanoplus rehni* new species. Cercus of male (*type*). (Greatly enlarged.)
- Fig. 6.—*Melanoplus oreophilus* new species. Lateral outline of distal portion of abdomen of male (*type*). ($\times 9$)
- Fig. 7.—*Melanoplus oreophilus* new species. Lateral view of female (*allotype*). ($\times 3$)

- Fig. 8.—*Melanoplus calapooyae* new species. Dorsal view of male supra-anal plate (*type*). ($\times 13$)
- Fig. 9.—*Melanoplus bernardinae* new species. Dorsal view of male supra-anal plate (*type*). ($\times 17$)
- Fig. 10.—*Melanoplus bernardinae* new species. Lateral outline of distal portion of abdomen of male (*type*). ($\times 10$)
- Fig. 11.—*Melanoplus olamentke* new species. Lateral outline of distal portion of abdomen of male (*type*). ($\times 9$)

PLATE XVIII

- Fig. 1.—*Melanoplus eumera* new species. Cercus of male (*type*). (About $\times 15$)
- Fig. 2.—*Melanoplus ponderosus ponderosus* (Scudder). Cercus of male. Sweetwater, Texas. (Same scale as fig. 1.)
- Fig. 3.—*Melanoplus tunicae* new species. Lateral outline of distal portion of abdomen of male (*type*). ($\times 8$)
- Fig. 4.—*Melanoplus tunicae* new species. Cercus of male (*type*). (Same scale as fig. 1.)
- Fig. 5.—*Melanoplus ponderosus viola* (Thomas). Cercus of male. St. Louis, Missouri. (Same scale as fig. 1.)
- Fig. 6.—*Melanoplus alabamae* new species. Lateral outline of distal portion of abdomen of male (*type*). ($\times 8$)
- Fig. 7.—*Melanoplus alabamae* new species. Cercus of male (*type*). (Same scale as fig. 1.)
- Fig. 8.—*Melanoplus calapooyae* new species. Cercus of male (*type*). (Greatly enlarged.)





